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Tooth graft socket augmentation and immediate implant placement Case Report

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Abstract

Nowadays, patients seek to resolve edentulous cases as quickly as possible, using as few surgical procedures as possible. There is no exception for the post-extractive implantation, which currently has a high success rate1. The problem in this case constitutes the modification of the post-extractive alveolus form to allow the best anchoring of the implant, to ensure a high primary stability1. Often, it is necessary to use the grafting materials that fill soft and strong tissue defects. The best graft materials are autologous ones called the "gold standard"1 and that is why we should aim to use them with less invasive techniques and with the highest efficiency possible.

Introduction

In most cases, the tooth socket changes significantly after removing a tooth. Often, different graft materials are required to be placed in the post-extractive alveolus before a dental implant or prosthesis is placed, to maintain the volume of hard and soft tissue and thus maintain aesthetics and allowing normal restoration. The ideal graft material is osteoconductive, osteoinductive and osteogenic[2,9]. That is why autologous bone graft, with its known limits, is considered to be the "golden standard"[1] reference graft. Autologous bone need donor sites to acquire, which leads to the need for an additional intervention, not always preferred by the patient, and not always easy for the treating dentist. However, there is another autologous biomaterial, which has the same values and consistency as the cortical bones we have available in our dental surgery when we extract the teeth[2,6,7,8]. This material is teeth hard tissues. Dr. Itzhak Binderman, a bone tissue specialist at Tel Aviv University and Dr Lari Sapoznikov, have developed a system that allows an extracted tooth to be transformed into decontaminated tooth particles, ready for autologous implantation in dental alveoli newly extracted or bone defects, in a simple three-step procedure[2].

Case description

The healthy patient, female 40 years old presented with pain and mobility of the lingual, fractured and infected #46 (Fig. 1. a. b.). The patient is an occasional smoker but can quit smoking without problems. The partial CBCT reveals a large periapical lesion and not adequately treated root canal therapies done many years ago, unproblematic till now (Fig. 2.). The technique used, appears to be a single cone gutta-percha filling with endomethasone paste (a very spread filling technique in Albania). Also the CBCT revealed the lingual wall fractured extending till the furcation, inside the bone. The proposed treatment plan was Extraction of #46; immediate TMI PBRI 4.7x13 implant placement with immediate bone grafting "Sticky Tooth", BCGF[9,10] membrane covering and Sohn's Poncho Technique[11]. The soft tissues were shaped with an individual healing abutment in TSM[9,10] and the final single piece abutment was made in titanium alloy with castable perforated abutment with screw.

Implant surgery

In a single surgery, under intravenous conscious sedation anesthesia, the tooth was devided without raising a sulcular flap. To do so a piezoelectric surgery device was used. The roots was than separated and removed with a thin dental elevator (Fig. 3. a. b.). There was a thin bridge of buccal bone close to the gingival margin, which was to be preserved at all cost. An internal octagon connection, implant (4.7mm x 13mm, TMI PBRI) was placed slightly towards the lingual part of the socket[9] (Fig. 4. a. b. c. d.). Implant site preparation was carried out starting with ultrasonic piezoelectric surgery device and rotary drills with low speed of less than 100 rot/min and high torque of 99N/cm^2. An Unica osteotome of 3.7 was used with the "stop and go" technique in order to collect bone from the osteotomy site. Afterwards the site was exponentially expanded

using Bone expander kit for digital key (ECB1 - 1 for ø 3,7 x 13 - 15 ECC1 - 1 for ø 4,2 x 13 - 15 ECD1 – 1 for ø 4,7 x 13 - 15) from 3,7 to 4,7 in 3 steps[10]. Primary stability was also obtained by apical engagement of the long implant. In order to fill the root gaps the extracted tooth was first cleaned from the gutta-percha rests and filling material using a tungsten carbide bur. After that the pieces were grinded and sorted with Smart Dentine Grinder[2] (Fig. 3. d. e.). The procedure takes around 5 minutes to complete. Afterwards the cleanser and buffer solution is applied to the grinded pieces and then an ultrasonic cleaner (35W and 40KHz) was used to speed up the process. The total procedure takes about 9 minutes. Afterwards the particles were dried with a sterile gauze and heat plate for about 20 seconds. Meanwhile, blood was taken from the patient with Vacutainer system using 3pc 10ml red silica coated blood collection tubes and 1pc 10ml yellow not coated tube for "Sticky Tooth" and BCGF[3,4,5,9,10] (Blood Concentrated Growth Factors, Vlad Centrifuge) (Fig. 3. c.). "Sticky Tooth" was made with grinded tooth graft (SDG) and autologous bone particles (collected with Unica). The remaining soft and hard tissue defect, was exposed. This area was grafted as explained above. In order to seal the gingival margin with graft material and to enhance healing potential, a double layer of BCGF membranes was pierced through the Titanium Healing abutment immediately before its installation. This "poncho technique"[11] of delivering BCGF assured secure placement of the biologic enhancer, exactly where it was needed, at the edge of the gingival margin, without the use of conventional sutures (Fig. 5. b. c. d.). The mass of BCGF at the site was secured with 4.0 polyglycolic acid sutures (Fig. 6.).

Restorative phase

Approximately 2 months after the surgery, a CBCT was made to control the healing (Fig. 7.). The radiological and clinical situation resulted satisfactory so we removed the Titanium Healing abutment and replaced it with a temporary individual healing abutment in TSM, octagon connection with screw (Fig. 8. a. b. c. d.). It was formed in the clinic using a smaller diameter laboratory analogue of 4,2 (0,5mm narrower) so to create a soft tissue protection of about 2,5mm height. After 2,5mm it starts taking conical form (Fig. 9. a. b. c.). Definitive restorative work commenced with an impression technique using 3M polyether mixed with Penta mix (3M) to accurately record and convey the 3D peri-implant tissue contour to the dental laboratory (Fig. 10. a. b. c.). A casted single piece titanium alloy abutment was fabricated with patient's approval and insistence of not using zirconia (Fig. 11. a. b.). The custom Porcelain fused to metal, screw retained abutment was installed at 4.5-months post-surgery (Fig. 12. a. b. c. d.). The postoperative controls till now around 1 year from implant placement results satisfactory in terms of function and esthetics (Fig. 13. a. b.).

Results

We used for 2 years period the autologous tooth grinding machine, Smart Dentine Grinder, in various procedures including post-extractive alveolar preservation, distant grafts in implantation cases, apical resections, conventional and post-extractive implants. The tooth graft was used alone but mostly combined with other techniques like "Sticky Tooth" and BCGF.

Conclusions

The use of dentinal grafts whenever possible presents a simple and relatively short procedure to benefit from. Grafts obtained provide very good stability and ease of use. Also, the cost is comparable to the cheapest graft materials on the market, so exhibiting high cost-effectiveness. The procedure for the preparation of the graft is simple and with a method that takes time ranging from 11-15min. All these combined with the final result achieved mean that it is a "sin" that the extracted teeth are thrown away and not used nowadays.

Figure 1. a. #46 fractured on the lingual side, b. lingual pieces after the extrusion.

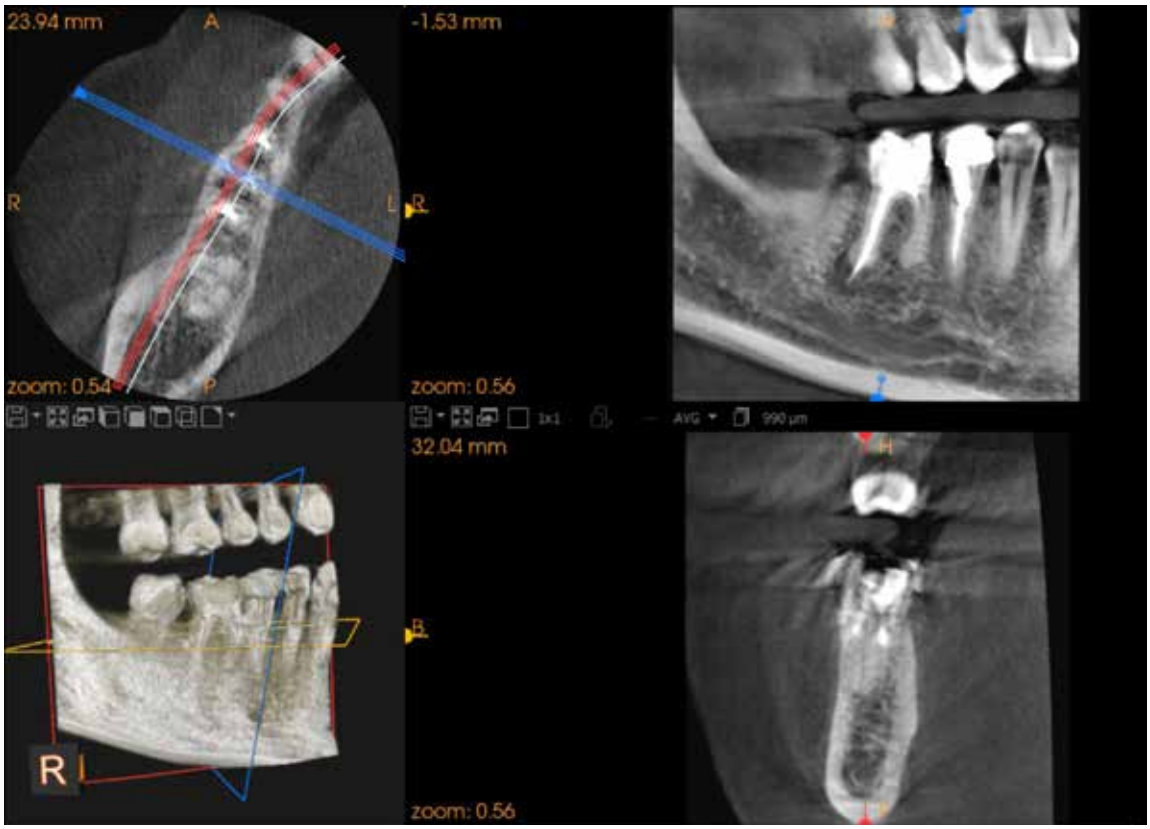

Figure 2. Partial CBCT showing # 46 fractured and infected.

Figure 3. a. separation with piezo aparatus, b. extracting with elevator, c. BCGF, d. tooth pieces in SDG, e. clean and buffered particles ready to become "Sticky Tooth".

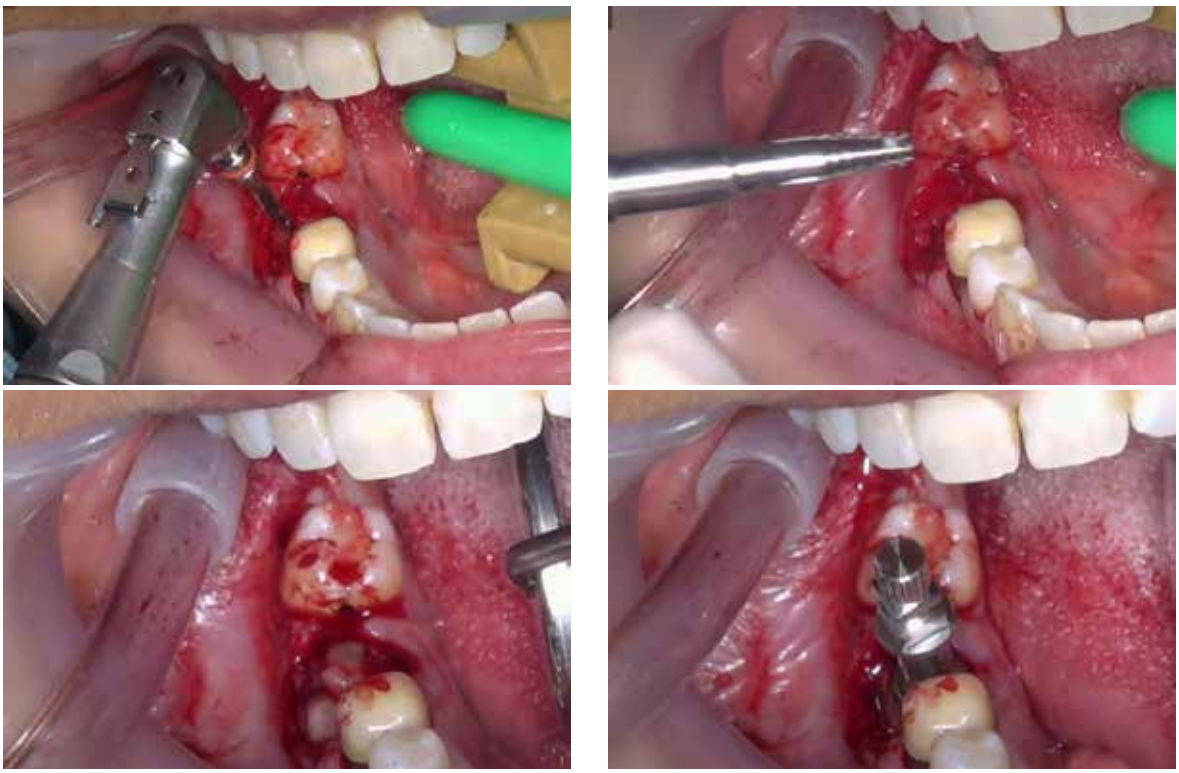

Figure 4. a. probing with probe, b. gradual expansion with expansors, c. glove technique for creating primary stability, d. implant insertion.

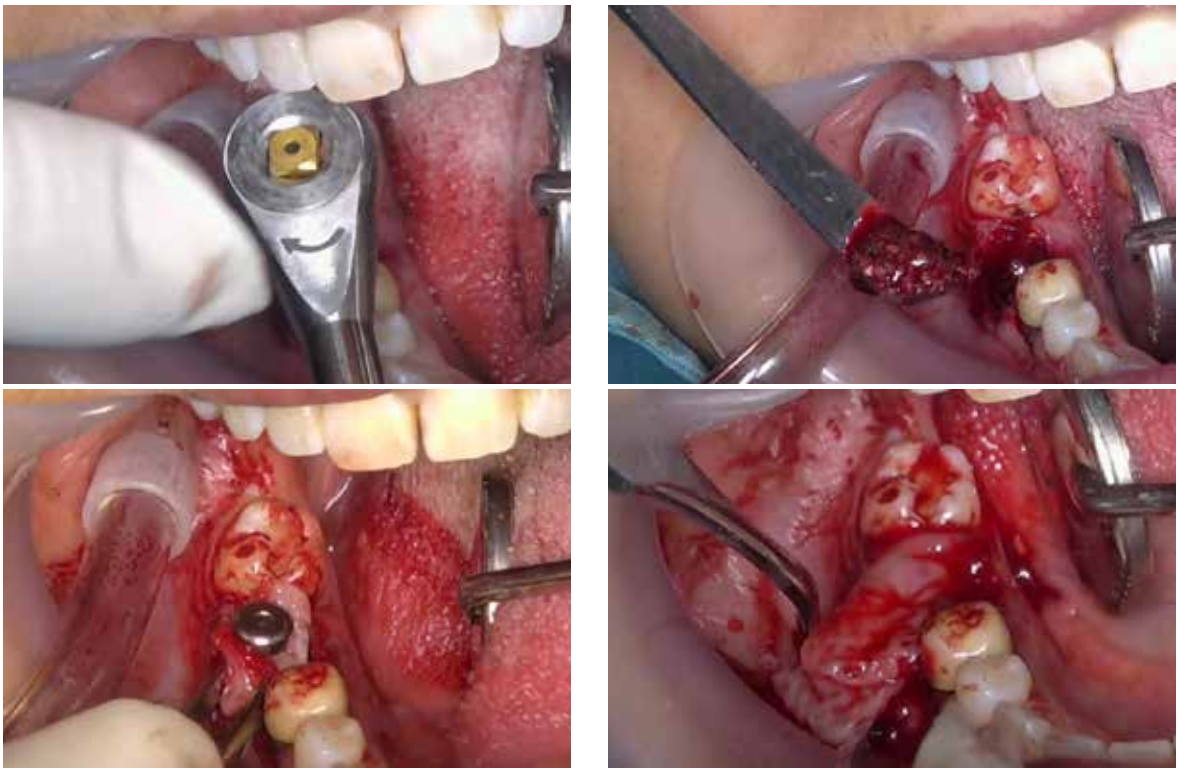

Figure 5. a. tightening of the implant, b. "Sticky Tooth" grafting around the implant, c. "poncho technique" with BCGF membrane, d. BCGF membrane on the healing cap.

Figure 6. Suture after implantation and grafting.

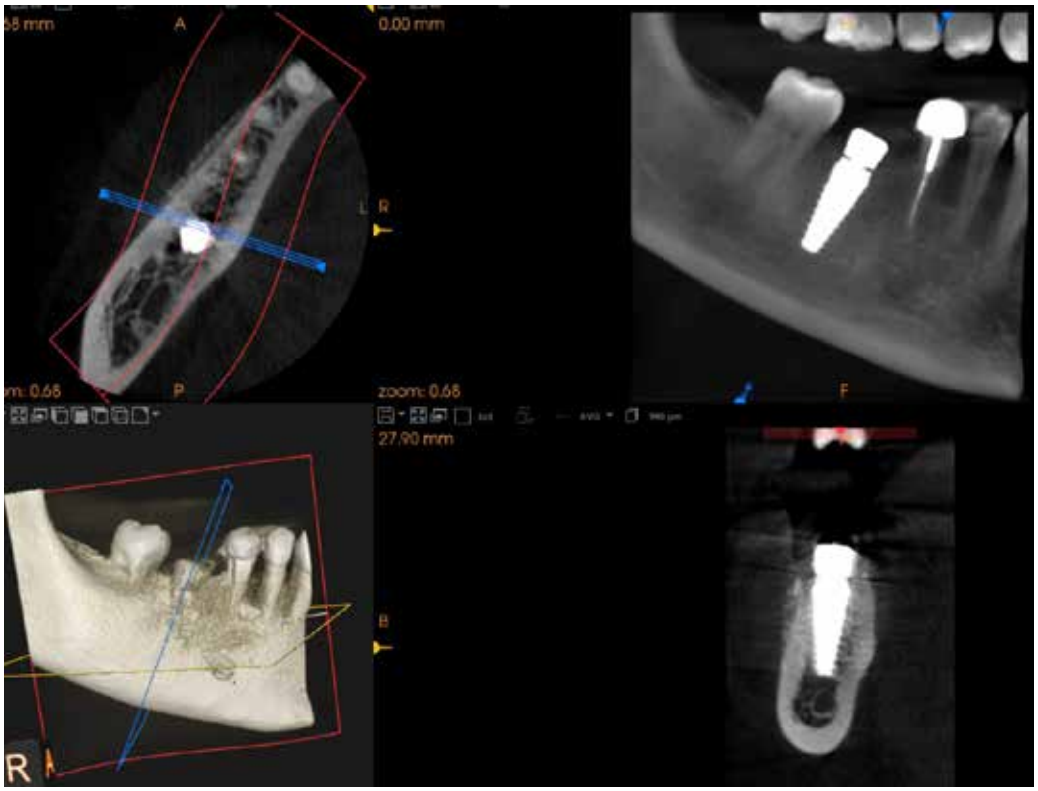

Figure 7. Cuttings of CBCT 2 months after implantation where complete sealing of the alveolus and good implant integration can be noticed.

Figure 8. a. condition in situ 2 months after implantation, b. individual healing cap in TSM, c. a picture of the technique creating of tissues over the implant, d. modeled healing cup.

Figure 9. a. the individual TSM healing cup on the vestibular side, b. alveola created by cup, c. the individual TSM healing cup on the lingual side.

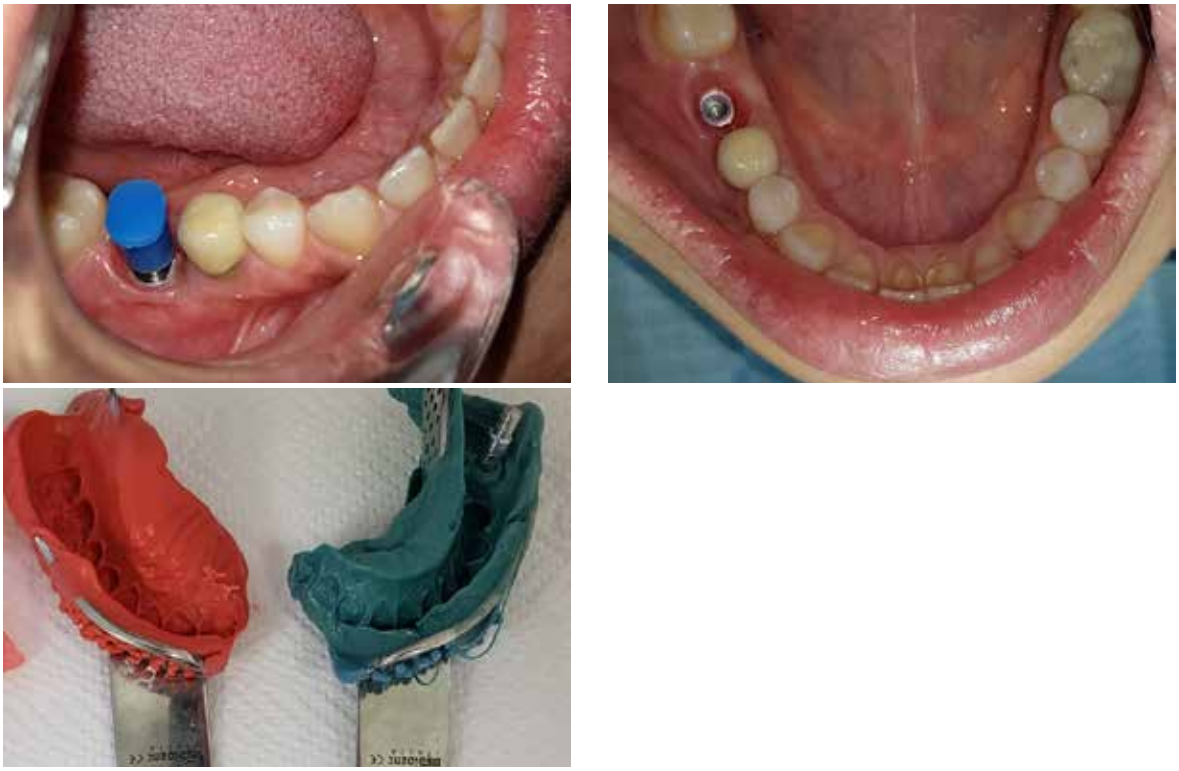

Figure 10. a. TMI transfer for normal impression sampling, b. polyether impression with the laboratory analogue and the opposite on silicon, c. alveola at the moment of taking the impression.

Figure 11. a. vestibular titanium abbutment test before porcelain, b. lingual view.

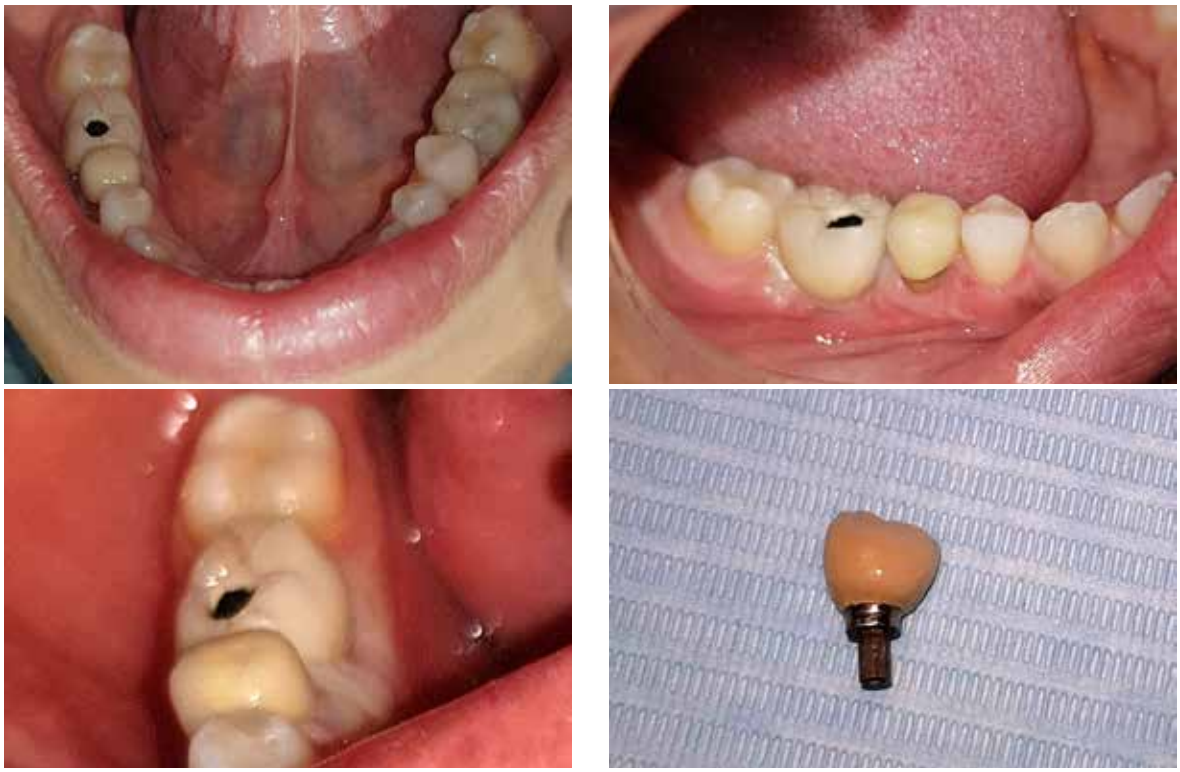

Figure 12. a. superstructure in titanium-porcelain alloy fixed with screw, occlusal side, b. lingual, c. vestibular part, d. appearance out of the mouth.

Figure 13. a. Control after 1 year of occlusal view, b. vestibular view.

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