Explantation of an implant in a heavy smoker

Literature

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Introduction

Dental implants are increasingly being used to restore missing teeth. Thanks to further developments in implantology, it is now possible to offer patients an individualised, optimal dental prosthesis. Despite an optimal surgical procedure, implant loss can occur. In the following article, the authors report one case of a heavy smoker in whom an implant had to be removed after 4.5 years owing to a material defect of the screw, despite excellent osseointegration.

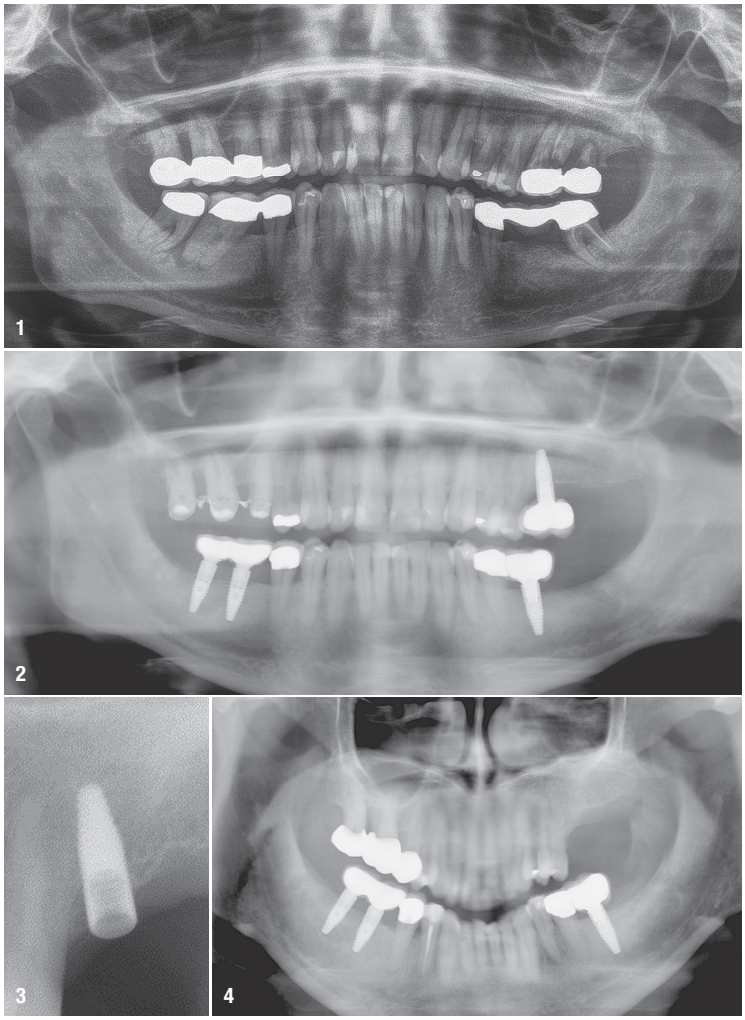

Fig. 1: Radiograph showing the situation before the initial implantation. **Fig. 2:** Radiograph showing the situation immediately after the initial implantation. **Fig. 3:** Part of a radiograph showing the fractured implant screw prior to removal. **Fig. 4:** Radiograph showing the situation after implant removal.

Heavy smoking (smoking of more than 20 cigarettes per day) is always considered a significant risk for successful long-term osseointegration of implants and is associated with higher rates of implant failure than in non-smokers. Smoking slows down the healing process and reduces the long-term prognosis and service life of dental implants to a substantial extent. In a large study conducted by Cavalcanti et al., it was demonstrated that the risk of implant loss is twice as high for heavy smokers as for non-smokers.[1] The ingredients of tobacco smoke increase susceptibility to gingivitis and periodontitis.

Initial clinical situation

The patient was female and aged 53. She was a smoker who reported that she smoked 30 cigarettes a day. The bone quality was D3 in the maxilla and D2 in the mandible (Fig. 1). Thorough patient education was carried out and the patient agreed to the publication of her case.

Materials and methods

Implantation

The implantation had been performed five years before with DENTAL RATIO implants (DRS International) of 4.1 mm in diameter and 12.0 mm in length in the maxilla and of 3.7 mm in diameter and 12.0 mm in length in the mandible (Fig. 2). The specific implant system used here allows for earlier loading compared with other systems owing to its specific surface structure. The implantation was carried out in a "multiple play" situation, and the implants were restored with conditionally removable screw-retained prostheses. A crestal incision was made while protecting the bone structures. Control follow-ups after implantation were done every week for the first six months and then every two years.

Intervention

After 4.5 years, the implant screw fractured and another intervention was required (Figs. 3 & 4). There was no peri-implantitis. The implant screw was sent in for his-

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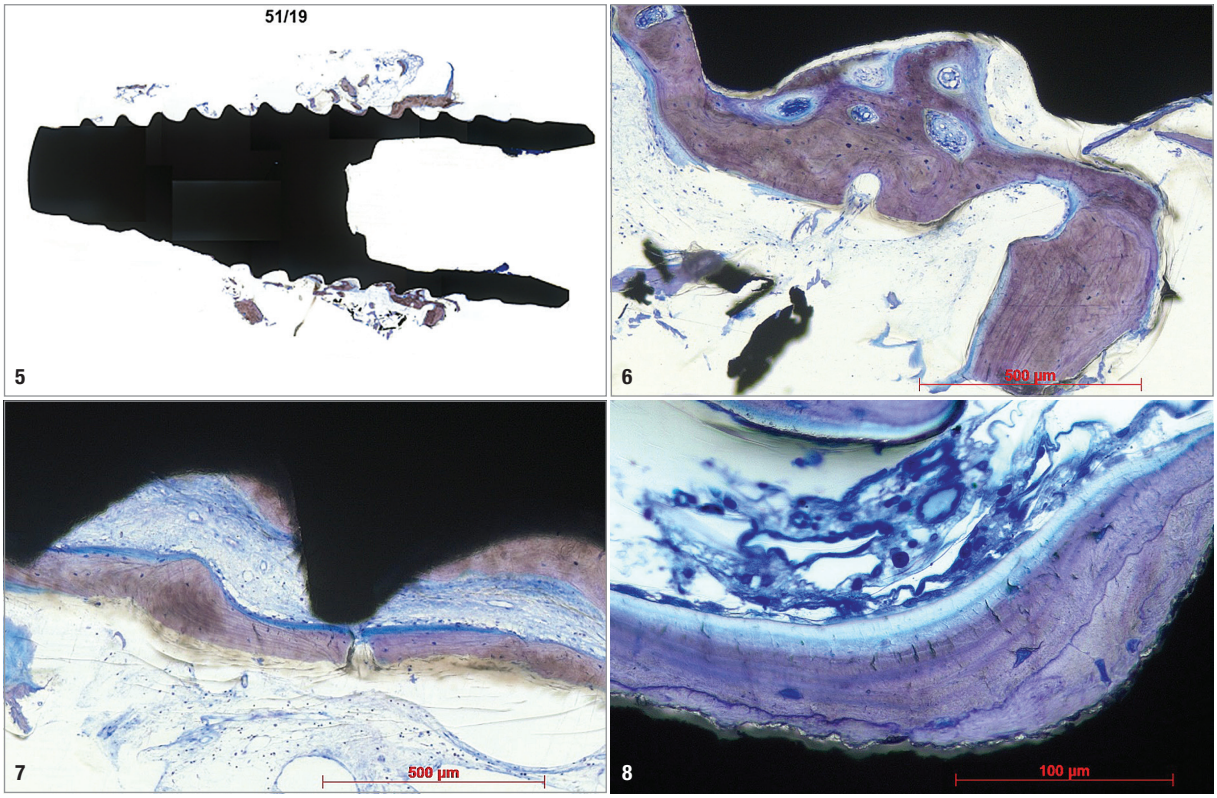

Fig. 5: Thin-section view of the explanted implant: there was cancellous bone and soft tissue attached at the middle and crestally; three to four upper threads were approximately 70 % covered with bone crestally; there was attached loose connective tissue and peripherally attached soft tissue consisting of loose connective tissue rich in vessels; some bone fragments were detected crestally. When magnified further, tight bone-to-implant contact was visible. **Fig. 6:** Higher magnification: the bone-to-implant contact was too tight, especially crestally under formation of a 5–10 nm wide amorphous interface; there was lamellar bone with vital osteocytes; osteocytes were near to the implant surface; on the outer bone surface, there were signs of osteogenesis with osteoblast seams and osteoid sediments; peripherally, there was slightly more dermal osteogenesis with formation of osteoblast condensations, osteoids and fragments of mature lamellar bone; there was loose connective tissue rich in cells and vessels with some mastocytes and fat cells; near to the implant, there was accumulation of focal vessels; there were small osteoclasts in a few places; crestally, there was resorption on the surface; no necrosis or infiltrates were detected. **Fig. 7:** Microscopic image of the explanted implant showing good bone-to-implant contact and successful osteogenesis. **Fig. 8:** Microscopic image of the explanted implant showing good vascularisation.

tological examination, for which the material was processed conventionally by means of thin-section microscopy according to Donath and dyed with toluidine blue. The histological examination based on particulate blocks of the explant showed good contact between the bone and explant (Figs. 5–8). Crestally, there was good osseointegration with good bone-to-implant contact. Near the implant, regular osteogenesis and peripheral contact osteogenesis could be observed. In addition, there was very good vascularisation in the peri-implant area. No necrosis or inflammatory tissue was detected. Bone augmentation by means of NanoBone (Artoss) was necessary for the replacement of the implant (Fig. 9).

Medication

After microbiological examination, an antibiotic (Clindamycin Aristo 600, Aristo Pharma) was administered (first one tablet three times a day and then one tablet twice a day until the day of surgery). In addition, the patient was instructed to rinse twice daily with Chlorhexamed (GlaxoSmithKline). For the postoperative period, 20 mg prednisolone were prescribed (first one tablet three times a day, then half a tablet three times a day and finally a quarter tablet three times a day). Five arnica globules were prescribed daily to reduce swelling. Directly after the operation, 40 mg of Dexa-ratiopharm (ratiopharm) were injected intramuscularly. Before the operation, the patient was advised to increase her intake of calcium, multivitamins and antioxidants in order to stabilise the immune system.

General approach to implant insertion

Local anaesthesia was achieved bilaterally with Ultracain D-S forte (Sanofi-Aventis Deutschland). Another mandibular anaesthesia was achieved with half an ampoule of Ultracain D-S forte. A 14C scalpel (Aesculap) was used for making the incision, with attention to the optimal preservation of the gingival mucosa.[2] With this incision, more keratinised gingiva is obtained, which leads to better healing of implants. The preparation of the osteotomies

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Implants 2

Practice stamp

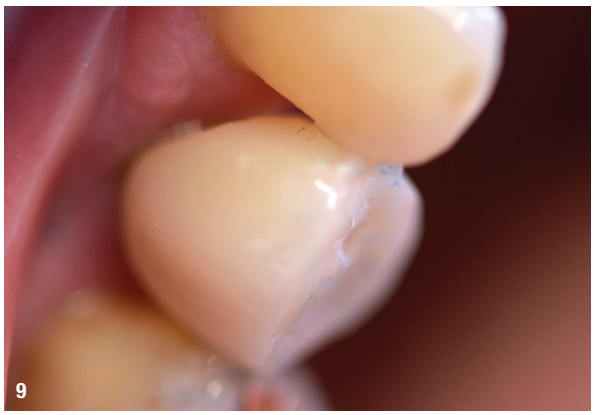

Fig. 9: Clinical situation showing the newly replaced implant.

was begun with the 1.80 mm pilot drill and continued with the 2.28 mm drill. For the final drilling, a 2 mm drill was used. The machine-cut implants were placed to a torque of 40 Ncm. To avoid unnecessary pressure on the jawbone, each implant was turned to the left for half a rotation. This provides optimal blood flow to the implant surface (DENTAL RATIO, MEISINGER) and can minimise or completely avoid bone necrosis. Finally, a periosteal slit was made to achieve flap closure without tension. The surgical site was sutured using vertical sutures (5/0 suture, RESORBA).

Follow-up appointments

The success of the implant surgery was evaluated in the follow-up examinations on the basis of the following criteria: no mobility of the implant, clear sound during the tapping test, inconspicuous periosteal test (Osstell), no pain during the healing period, no infections during osseointegration, and radiographically no evidence of gaps between the implant and the bony substance around it. In addition, a good macroscopic condition of the implant, low plaque accumulation and the absence of osteolytic signs on the control radiograph served as parameters for success. The osseointegration of the implants placed five years before could be described as good.

Discussion

The existing implant showed good osseointegration after 4.5 years. It can be argued that material properties rarely lead to explantation. The introduction of implants in smokers significantly influenced survival rates, the risk of postoperative infection and marginal bone loss. The results should be interpreted with caution owing to the presence of uncontrolled confounding factors in the included studies. Recent studies indicate that smoking is a major factor contributing to the failure of dental implants. The authors of this article aim to test the null hypothesis that implant failure rates, the risk of postoperative infection and marginal bone loss are no different in smokers compared with non-smokers.

Conclusion

Smoking has an impact on the general and oral health of patients. Tobacco has a rapid adverse effect on the outcome of all therapeutic interventions in the oral cavity. The osseointegration of implants is a risk in smokers, and the risk of peri-implantitis increases in these patients. Various protocols have been tested to evaluate implant survival in smokers. Although dental implants aimed at integrating with the human body have become the state of the art for dental restorations, they are still not always suitable for smokers owing to the aforementioned reasons. In order to further research on this topic, it is important to conduct an updated periodic review to summarise all of the relevant clinical research results.

Editorial note: Dr Inge Schmitz declares that she has no conflicts of interest in relation to this article. Dr Branislav Fatori would like to thank Ulf-Christian Henschen of DRS International (Langenfeld, Germany) and Dr Walter Gerike from Artoss (Rostock, Germany) for their support.

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Dr Branislav Fatori has more than 41 years of experience in implantology and has placed more than 8,000 implants. He was trained at prominent clinics around the globe. Also, he has worked as a long-term training consultant for professional societies and implant manufacturers.

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