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Dental implant failure repeated at the same site or occurred in one or more implants: A case report

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Despite the fact that advances in science are improving the success rate of dental implants, a few implant failures consistently have been reported. Implant failure can come in three different forms; single, repetitive and cluster behavior. The single type refers to a single implant failure, the repetitive type refers to two or more failures at the same site, and the cluster type refers to more than one implant failure per patient that does not have to occur in the same position or quadrant. The purpose of this presentation is to investigate the rare cases of repetitive and cluster failure. **(THE JOURNAL OF KOREAN ACADEMY OF OSSEOINTEGRATION 2022;14(1):36-43)**

Key words: Dental implants, Implant failure, Peri-implantitis, Retreatment

INTRODUCTION

Dental implants replacing for missing teeth have been demonstrated to be a successful treatment with high survival rate about 90%, although some clinical situations that result in implant removal continue to be a failure[1-4]. Additionally, the high implant survival rate has made it difficult to pinpoint specific risk factors for implant failures, but patients-related factors, implant characteristics, implant location, and surgeon's experience make up the majority of identified factors for implant success[5].

Several studies have looked into the survival rates of implants placed in previously failed sites. Implant failure can come in three different forms; single, repetitive and cluster behavior. The single type refers to a single implant failure, the repetitive type refers to two or more failures at the same site[5-7], and the cluster type refers to more than one implant failure per patient that does not have to occur in the same position or quadrant[5,8-10]. The purpose of this case report is to investigate the rare cases of repetitive and cluster failure.

CASE REPORT

1. Case 1: repetitive failure

A 76-year-old male patient visited the clinic with a chief complained of uncomfortable mandibular denture. He had been taking antithrombotic drugs due to a history of stroke 3 years prior to visit. As for the past dental history, #33 implant was placed 6 years ago (USII 4.0 × 11.5 mm, Osstem Implant Co., Seoul, Korea). Clinical examination revealed that the #33 implant presented with 12 mm probing depth on the labial and bleeding on probing with suppuration. The panoramic radiographic view showed a peri-implant radiolucency on #33 implant. #33 implant removal with alveolar ridge preservation (ARP) and implant placement at #33 implant removal site were planned under the diagnosis of a peri-implantitis (Figure 1).

After #33 implant removal, ARP was performed with deproteinized bovine bone mineral with 10% collagen and collagen membrane (Bio-Oss Collagen® 250 mg, Geistlich biomaterials, Wolhusen, Switzerland, and Bio-Gide® 13 × 25 mm, Geistlich biomaterials, Wolhusen, Switzerland). During surgery, the labial bone of removal site was completely destroyed.

On the cone beam computed tomography (CBCT) image taken 5 months after ARP (Figure 2A), new bone formation was found following the previous defect configuration, and thick cortical bone was detected on the lingual side (Figure 2B).

1 month later, implant installation with additional guided bone regeneration (GBR) on buccal side and connection of healing abutment were performed (TSIII 4.0 × 10 mm; Osstem Im-

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plant Co., Seoul, Korea). The GBR was performed with deproteinized bovine bone mineral with 10% collagen and collagen membrane (Bio-Oss Collagen® 100 mg and Bio-Gide® 13 × 25 mm). Initial stability of #33 implant was 26 Ncm of insertion torque. Sutures were removed after 10 days with uneventful healing (Figure 3).

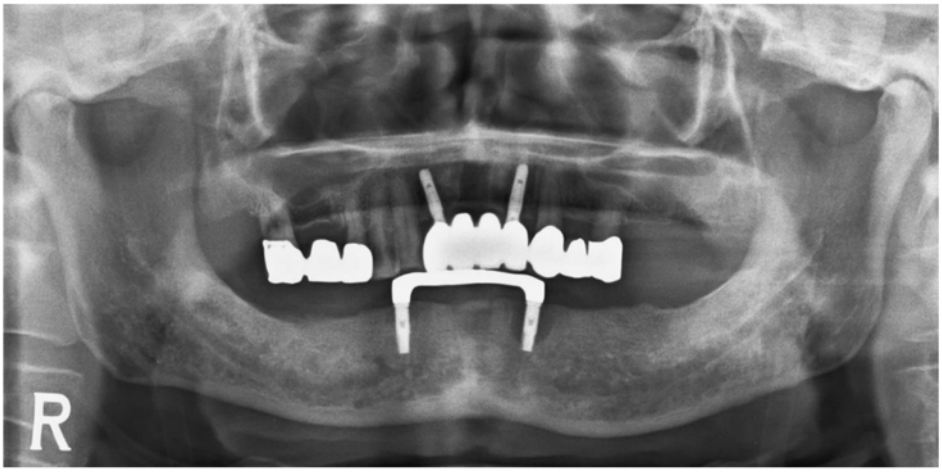

Figure 1. Pre-operative panoramic radiograph.

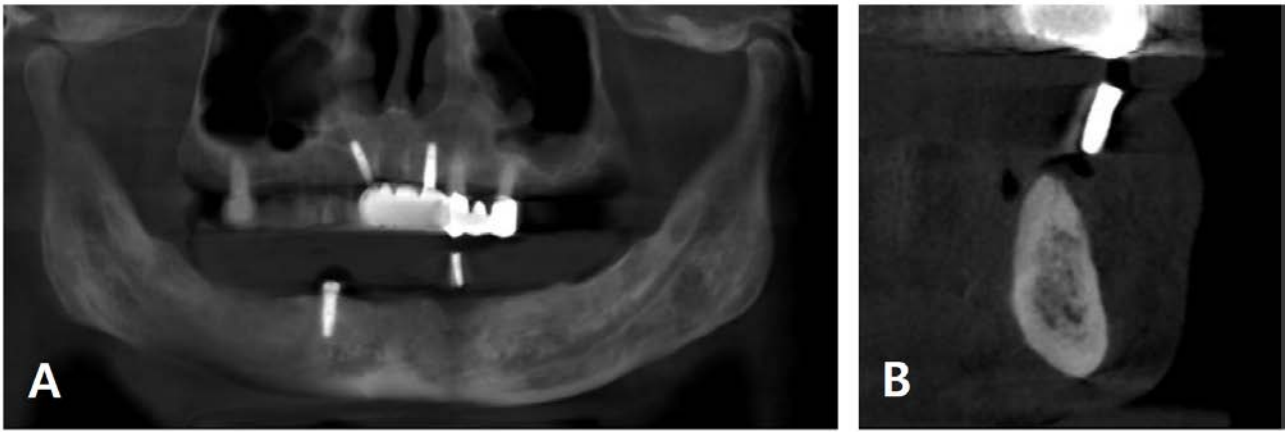

Figure 2. CBCT image taken 5 months after ARP. (A) Panoramic view. (B) Paraxial view: thick cortical bone on the lingual side was detected.

Figure 3. CBCT image after #33 implant installation. (A) Panoramic view. (B) Paraxial view.

6 weeks later of implant surgery, peri-implant radiolucency on periapical radiograph with implant mobility was detected (Figure 4). The implant removal with ARP and implant placement at the same site were planned under the diagnosis of osseointegration failure. After removal of implant, ARP was performed (Bio-Oss Collagen® 100 mg and Bio-Gide® 13 × 25 mm). 2 months later, CBCT was taken for evaluation before implant placement (Figure 5).

2 months after CBCT taking, a shorter implant was placed than before (TSIII 4.0 × 8.5 mm). This is because there was a high bone density region owing to previously existing chronic inflammation, and overheating was prevented by under-drilling this area. Initial stability of #33 implant was 13 Ncm of insertion torque. Sutures were removed after 10 days with uneventful healing (Figure 6).

6 weeks later, however, implant mobility with positive on percussion was detected. During the patient's interview, it was

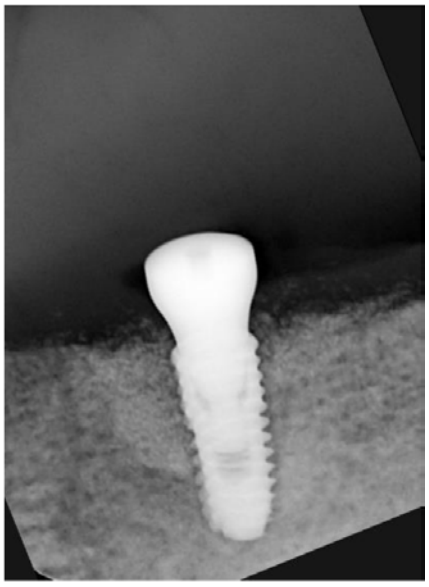

Figure 4. Periapical radiograph at 6 weeks later of implant surgery with peri-implant radiolucency.

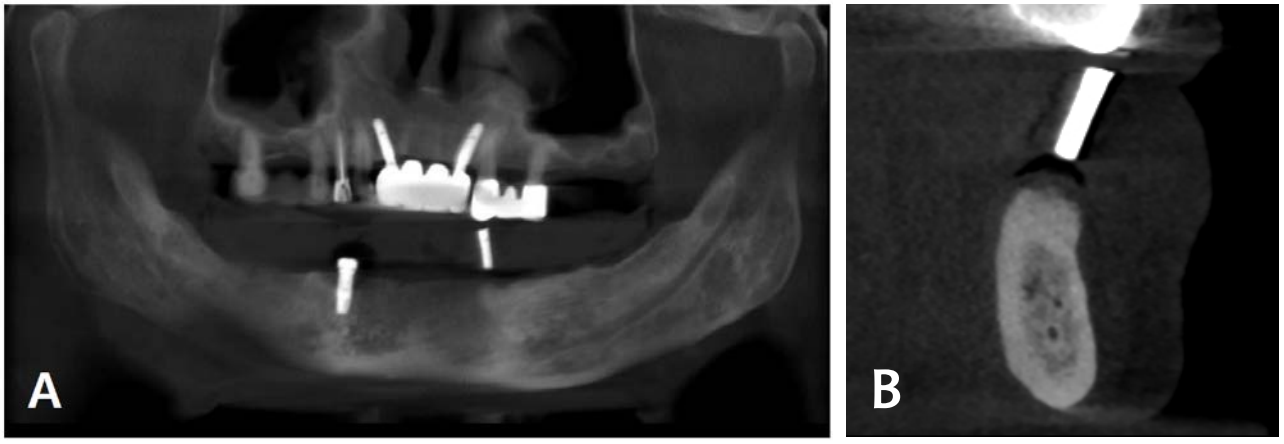

Figure 5. CBCT image at 2 months later of #33 implant removal and ARP. (A) Panoramic view. (B) Paraxial view.

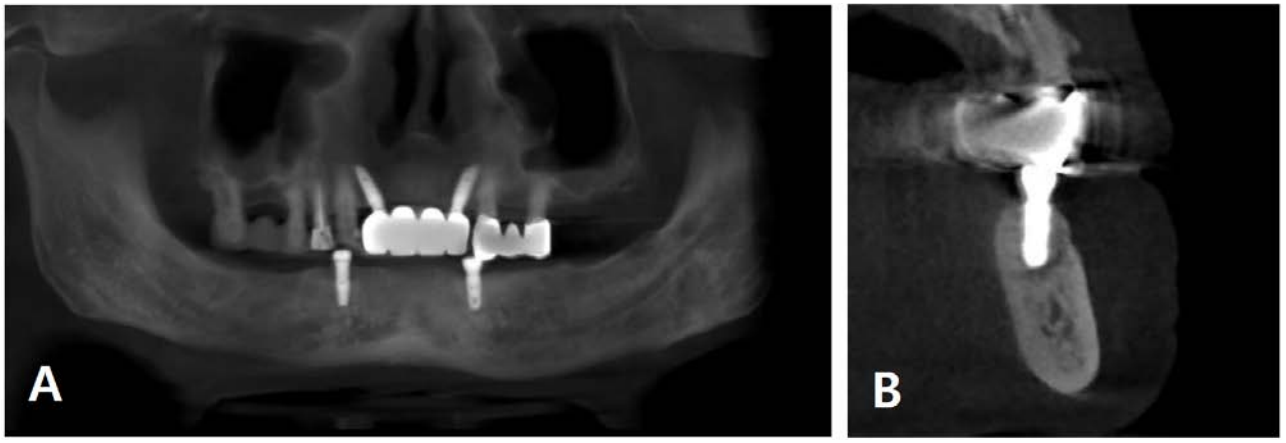

Figure 6. CBCT image after #33 implant installation with shorter length fixture. (A) Panoramic view. (B) Paraxial view.

found that the healing abutment had been chewed, and this time, the removal and implant placement in another site were planned at the same time. After one month, implant was installed on #32 site because the mental nerve was situated posteriorly in relation to the original implantation site. Initial stability of #32 implant was 35 Ncm of insertion torque, and sutures were removed after 10 days with uneventful healing. No sign of osseointegration failure was seen at the follow up period, and maintenance has so far been proceeding without any abnormal findings two years after the overdenture delivery (Figure 7).

2. Case 2: cluster failure

A 50-year-old male patient visited the clinic with a chief complained of implant installation on maxilla. He had hyperlipidemia but didn't take any medication. He also had oligodontia history except #15, 25 tooth. As for the past dental history, #33, 35, 43, 45 implant was placed 15 years ago (USII 3.75 × 15 mm on #33,43 implant, and USII 4.0 × 15 mm on #35, 45 implant), and the maxilla was edentulous since two years ago due to extractions of #15 and #25. As for the treatment plan, after placing 4 implants in the maxilla, restoration was planned with implant-supported fixed-hybrid denture (Figure 8).

Implant installation with additional GBR on #13, 23 buccal side and connection of healing abutment were performed (Straumann® Bone Level Tapered 4.1 × 10 mm on #13, 23 implant and 4.8 × 10 mm on #15, 25 implant, Waldenburg, Switzerland). The GBR was performed with deproteinized bovine bone mineral with 10% collagen and collagen membrane (Bio-Oss Collagen® 250 mg and Bio-Gide® 25 × 25 mm). Initial stability of #13,15,25 implants was 35 Ncm of insertion torque, and 24 Ncm on #23 implant (Figure 9). CBCT was taken after implant implantation (Figure 10).

5 days after implant placement, he visited the clinic for the healing abutment to fall out. At 2 weeks after suture removed, uncomfortable pain from the #15 implant was detected. 6 weeks after implant surgery, the implant stability quotient (ISQ) was measured by resonance frequency analysis (Osstell™ Mentor, Integration Diagnostics, Göteborg, Sweden) as 72/79 ISQ value on #13 implant, 68/72 ISQ value on 23 implant, and 76/80 ISQ value on 25 implant (buccal/proximal direction, respectively)[11]. On a periapical radiograph, however, it was able observe peri-implant

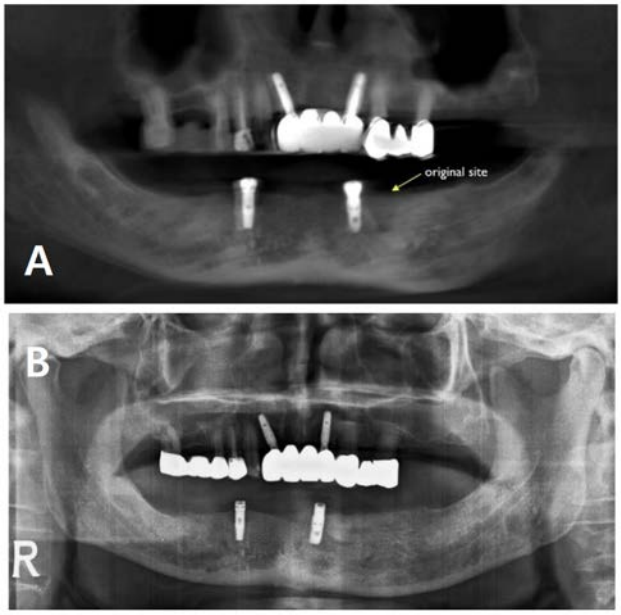

Figure 7. Panoramic radiograph. (A) Implant installation in another site (#32 site). (B) 2 years after the prosthetic treatment.

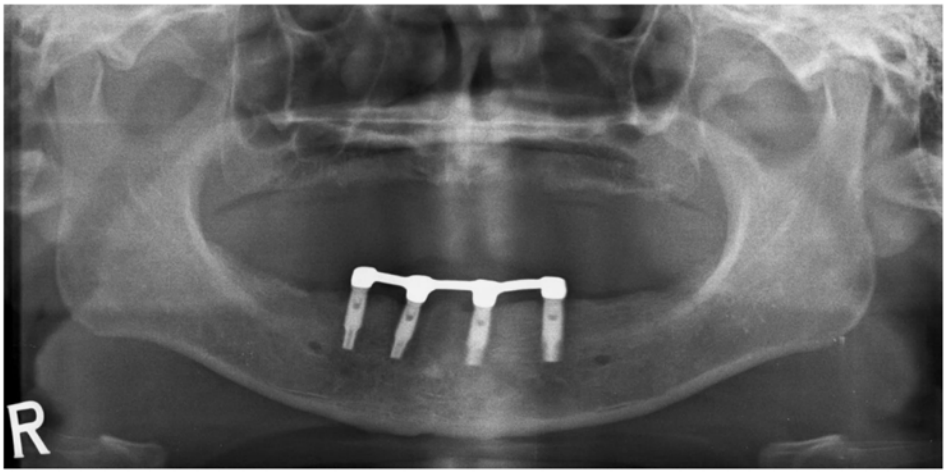

Figure 8. Pre-operative panoramic radiograph.

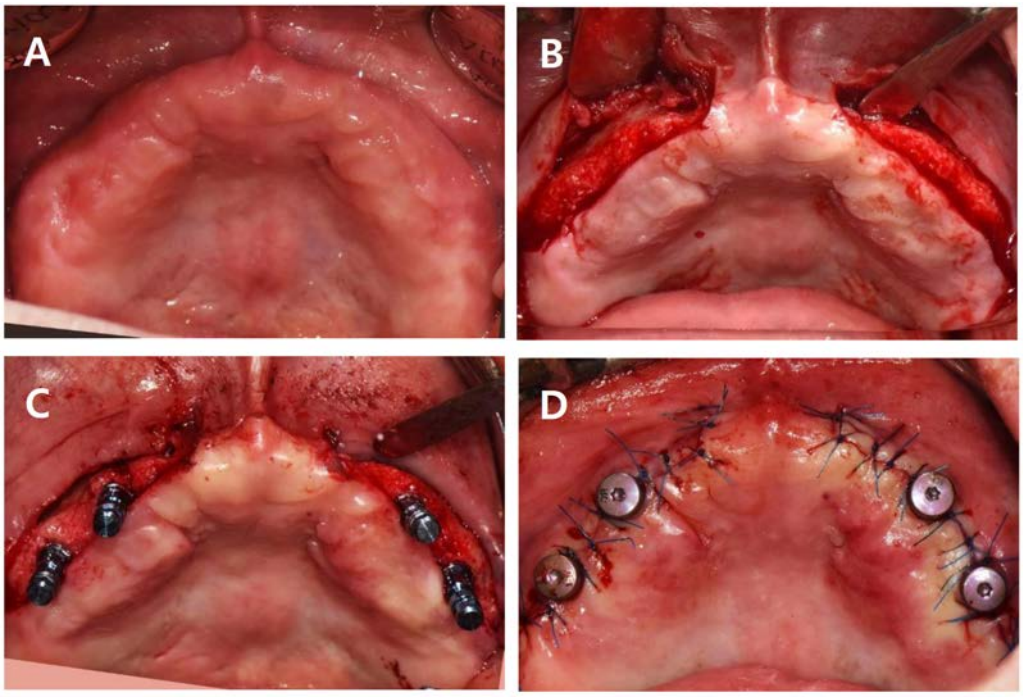

Figure 9. Clinical photographs. (A) Pre-operative photograph. (B) Flap reflection. (C) After implant installation. (D) Suture.

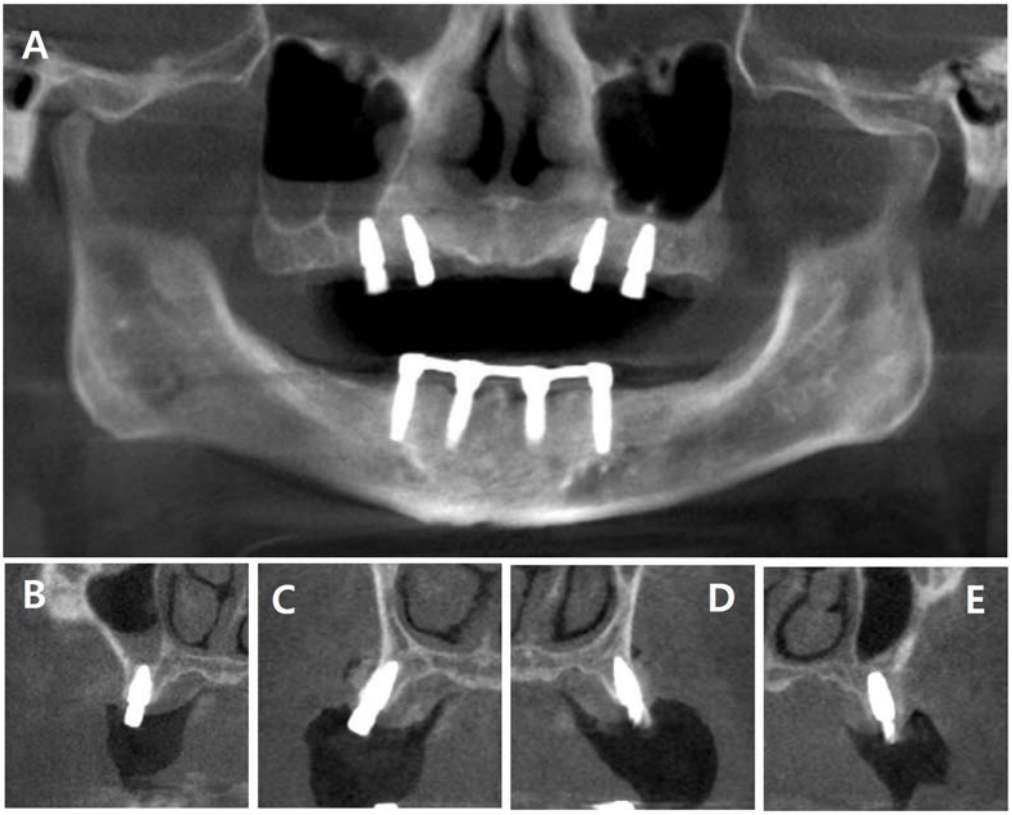

Figure 10. CBCT image after implant installation. (A) Panoramic view. (B) Paraxial view of #15 implant. (C) Paraxial view of #13 implant with lateral GBR. (D) Paraxial view of #23 implant with lateral GBR. (E) Paraxial view of #25 implant.

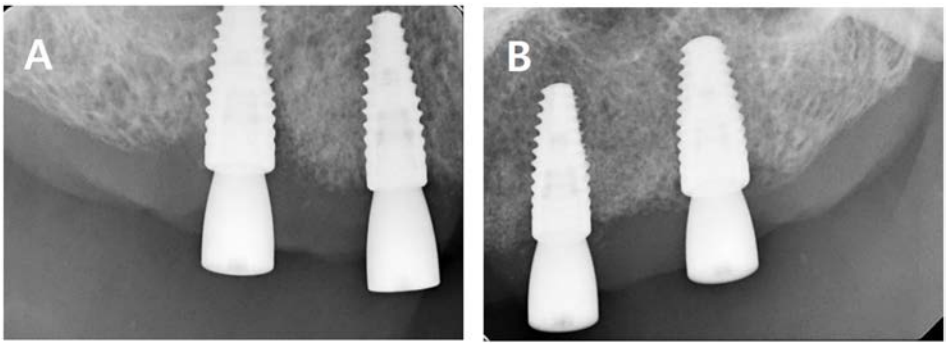

Figure 11. Periapical radiograph at 6 weeks later of implant surgery with peri-implant radiolucency on #15 implant. (A) #15, 13 implant. (B) #23, 25 implant.

radiolucency on #15 implant along with implant mobility and pain (Figure 11). The removal of #15 implant with ARP and implant placement at the same site were planned under the diagnosis of osseointegration failure. After removal of implant, remaining root fragment (Figure 12), which was invisible on CBCT, was removed together, and ARP was performed (Bio-Oss Collagen® 100 mg and Bio-Gide® 13 × 25 mm).

14 weeks after implant surgery, the ISQ was measured by resonance frequency analysis (Osstell™ Mentor) as 70/74 ISQ value on #13 implant, 69/70 ISQ value on 23 implant, and 77/79 ISQ value on 25 implant (buccal/proximal direction, respectively), and this value slightly decreased compared to the value measured 8 weeks ago (Figure 13).

5 months after #15 implant removal, implant installation on removal site was performed with 10 Ncm of insertion torque (Straumann® Bone Level Tapered 4.8 × 10 mm). However, patient complained of discomfort at the #13 implant site, and the ISQ value decreased to 65/62 with peri-implant bone loss observed on CBCT (Figure 14). The patient was informed that the #13 implant should be removed, but he refused and preferred to observe.

After 1 month of #15 implant installation, he visited the clinic complaining of pain with a clicking sound at #23 implant site while chewing with provisional denture. Clinical examination revealed that ISQ value decreased to 55/61 without pain or screw rotation, so healing abutment was changed with a reduced height. 1 month after of that day, it was decided to remove the #23 implant with decreased ISQ value of 44/53, but #13 implant had a similar ISQ value of 60/61, so further follow-up was planned. When he visited the clinic for removal of #23 implant 1 month later, ISQ value of #13 implant decreased to 52/48, so #13 implant was removed at the same time as the #23 implant with atelocollagen sponge insertion (Teruplug®, Terumo biomaterials Co., Tokyo, Japan). No sign of osseointegration failure of #15,25 implant was seen at the follow up period, and prosthetic treatment was re-planned with overdenture instead of implant-supported fixed-hybrid denture (Figure 15).

Figure 12. Clinical photograph of removed #15 implant fixture and root fragment.

DISCUSSION

This report presented rare cases the rare cases of repeated implant failure at the same site and cluster failure. Case 1 showed 3 failures at the same site. The estimated cause of 1st failure was infection due to peri-implantitis. The 2nd failure was thought to be caused by the bone overheating during drilling, and the 3rd failure was attributed to overloading on the implant due to chewing with the healing abutment. Case 2 showed a series of 3 implant failures. The failure of #15 implant was attributed to infection caused by the residual root fragment, and the failure of #13,23 implant can be related to overloading caused by parafunctional habit due to a history of recurrent fracture of the previously used denture.

Three failures in two cases are examples of osseointegration failure due to overloading, in which a healing abutment was connected by performing one-stage implant surgery. It is assumed

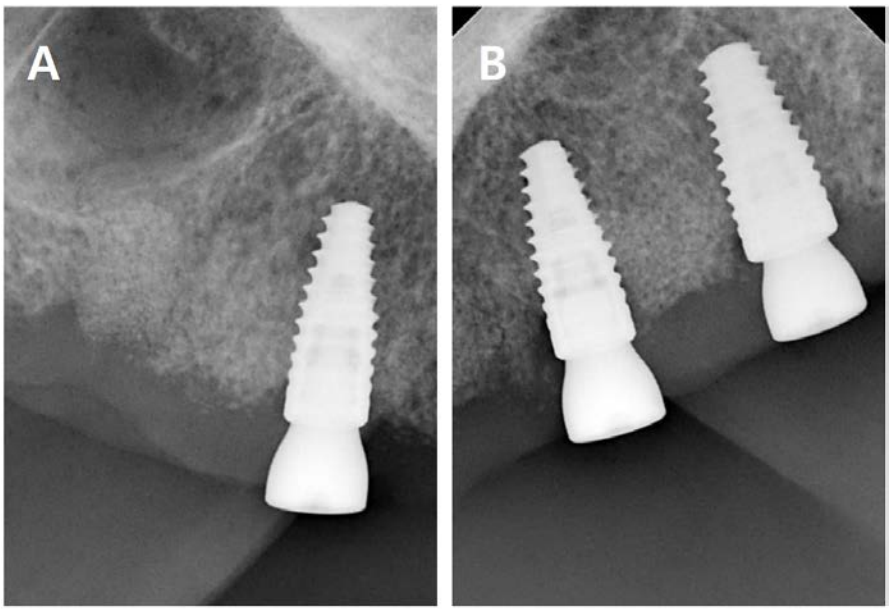

Figure 13. Periapical radiograph at 13 weeks later of implant surgery. (A) #13 implant. (B) #23, 25 implant.

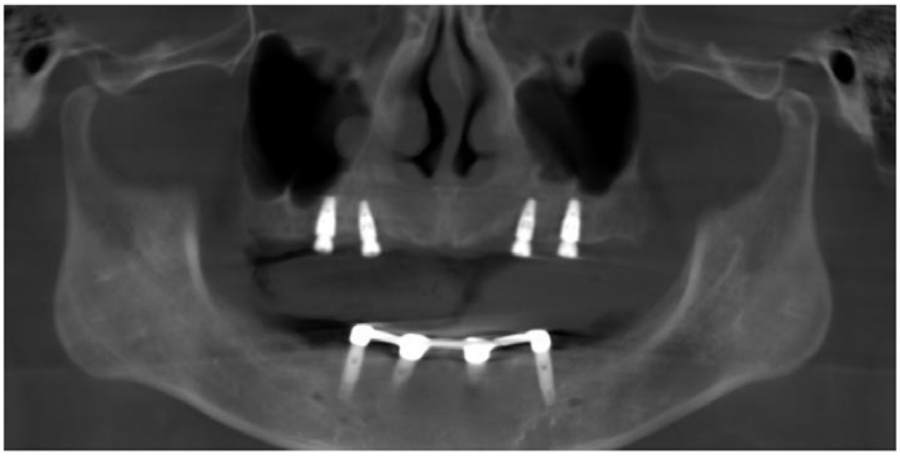

Figure 14. Panoramic view of CBCT image after #15 implant re-installation.

Figure 15. Panoramic view of CBCT image after #13, 23 implant removal.

that these patients failed osseointegration due to masticating with the healing abutment or harmful external force from the provisional denture applied to the implant. In the implant treatment of edentulous patients, the use of a provisional denture or the application of external force to the healing abutment does not result in implant osseointegration failure in all patients, but if a patient has excessive bite force, a healing abutment with reduced height or two-stage implant surgery to submerge the implant can be considered[12-14]. Additionally, installing a temporary implant could help to stabilize the temporary denture and distribute the load from the original implants[15].

A systematic review of publications up to late 2014 reported an 88% survival rate for replaced implants after failed implant removal[16]. According to the systematic review reported in 2020, the average survival rate for implants following retreatment was 86.3%, with follow-up ranging from less than a year to more than 5 years[17]. Compared to the survival rate obtained with the second attempt, the survival rate with the third attempt dropped by almost 73%[18]. As a result, the success rate of implant re-installation at the same site is significantly reduced, and studies clearly demonstrating the cause are still lacking. In a paper in 2019, overloading due to hard food consumption or parafunctional habits of clenching and bruxism was described as the main cause of failure in a study of 14 implants that failed frequently[6]. However, in many cases, it was difficult to determine the cause of failure.

CONCLUSION

This case report presented unusual cases in which implants failed repeatedly at the same place or more than one implant failure per patient that does not have to occur in the same position or quadrant. Through these cases and reviews, it has become clear that repeated implant failure is primarily due to overloading, however the precise cause has not been identified.

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