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Case Report

Clinical managements of implant periapical lesions: a report of three cases with five to twelve years of follow-up

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The purpose of this report is to suggest clinical managements of implant periapical lesions by presenting three clinical cases managed by either the infected form or the inactive form with the follow-up period of five to twelve years. One patient with no clinical symptom was regarded as inactive form. Two patients having pain were regarded as infected form and have been under the systemic antibiotic therapy. In one patient, the symptom subsided and the size of radiolucent lesion decreased. However, the other patient showed increased size of lesion causing the implant unstable, which leaded to remove the implant and to replace it. There was neither additional increase of the lesion nor functional problem for all three. It is important to detect implant periapical lesion in early stage before jeopardizing the stable implant and manage properly using systemic antibiotic therapy and surgical approach if needed, depending on infected form and inactive form. **(J Dent Rehabil Appl Sci 2015;31(2):150-7)**

Key words: dental Implants; peri-Implantitis; complications; periapical diseases

Introduction

Endosseous dental implants have been utilized as successful rehabilitative therapy in restoring partially and completely edentulous arches since osseointegration theory was introduced. Recently, the success rates of implants have increased markedly with the help of thorough understanding about bony responses and loading concepts. However, it may be difficult to determine the exact mechanism leading to implant failure because multiple factors contribute to the failure of implants indirectly as well as directly.[1]

Among those factors, the main causes of implant failure can be peri-implantitis and overloading to implants. It has been reported that the implant periapical lesion (IPL) also could be one of the complications leading to implant failure though its prevalence would be quite low. IPL is defined as a radiolucent lesion around the apical part of a stable implant,[2] which is characterized by suppuration, fistula formation, and loss of alveolar bone.[3] It is often found at the apical part of the long implant located at the cortical bone being stably supported and intimately contacted by normal bone at coronal part of it.[4] It is also called retrograde peri-implantitis related to premature loading, overloading, and microfracture by other trauma or occlusal factors.[5] The infection around apical part of implant can spread out coronally, proximally, and buccolingually. It can eventually destruct the alveolar bone near the infected implant devitalizing the adja-

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cent teeth and compromising stability of implant.[6]

The purpose of this report is to suggest clinical managements of IPLs by presenting three clinical cases managed by either the infected form or the inactive form with the follow-up period of five to twelve years.

Cases

1. Case 1

A 64-year-old male patient seeking to have his missing posterior teeth restored with dental implants came to the Department of Periodontics, Gangneung-Wonju National University Dental Hospital. The patient had arrhythmia, hypertension, rheumatoid arthritis, and blood coagulopathy and described that he lost the posterior teeth seven years ago by accident. Four cylindrical endosseous implants were placed by two staged approach on left and right mandibular second premolar and first molar areas (Fig. 1). Healing was uneventful and second stage surgery was done 3 months later. At the time of second stage surgery, periapical radiographs revealed a radiolucency at the apex of the implant of the mandibular right first molar area (Fig. 2). Although there was neither clinical symptom nor functional problem, the radiolucency has continued to exist up to the most recent twelve year-follow up (Fig. 3 - 5). No treatment was done in this case.

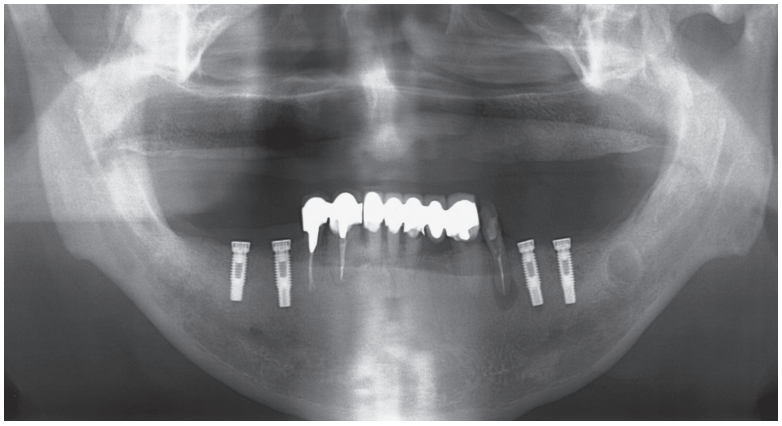

Fig. 1. Panorama after implant 1st stage surgery. Four endosseous implants were placed by two staged approach on left and right mandibular posterior area.

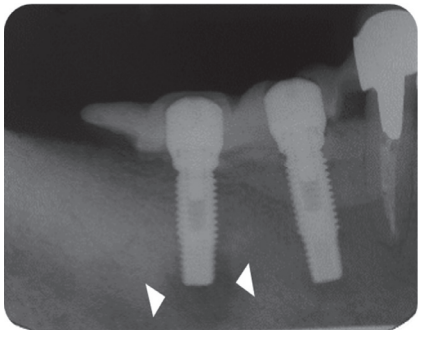

Fig. 2. Periapical radiograph at implant 2nd stage surgery which was done after 3 months of 1st surgery. It showed radiolucency at the apex of the implant of the mandibular right first molar area.
Arrow heads depict the extent of IPL.

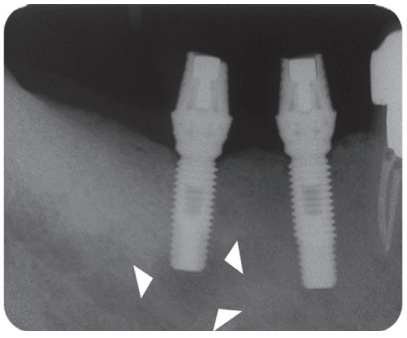

Fig. 3. Periapical radiograph after 9 months of implant placement.
Arrow heads depict the extent of IPL.

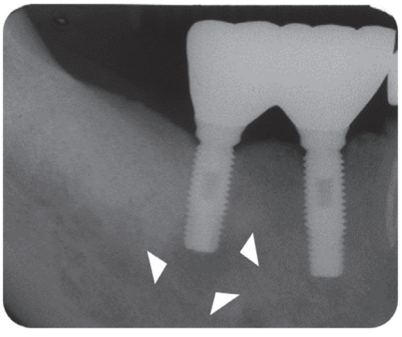

Fig. 4. Periapical radiograph after 6 years of implant placement still showing IPL at the apex of the implant of the mandibular right first molar area.
Arrow heads depict the extent of IPL.

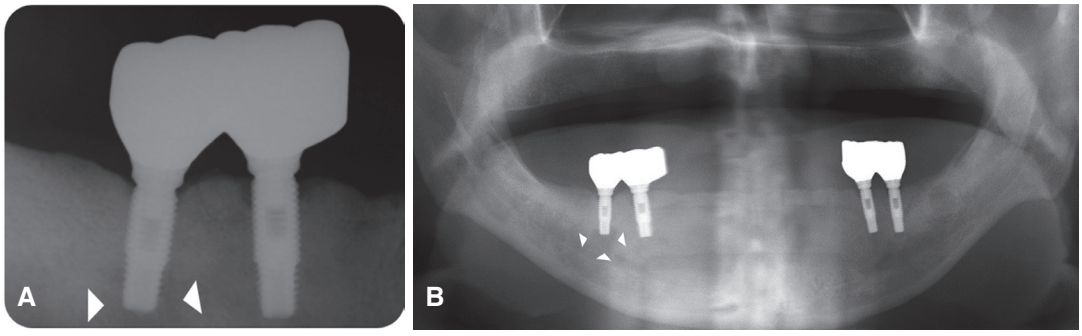

Fig. 5. (A) Periapical radiographof the twelve year-follow up. Although there was neither clinical symptom nor functional problem, the radiolucency has continued to exist, (B) Panorama of the twelve year-follow up taken on the same day of Figure 5A. Arrow heads depict the extent of IPL.

2. Case 2

A 53-year-old male patient presented with a tooth having severe dental caries which was not restorable in the area of right mandibular first molar. The tooth had previous endodontic treatment and right mandibular second molar was missing. It was planned to extract the tooth and to place two implants in the mandibular right first molar and second molar area. Extraction was accomplished and healing occurred without incident. About three months after the extraction, two implants were placed by two staged approach (Fig. 6). Two weeks after the first stage surgery, the patient presented with a complaint of pain. Clinical examination revealed no tenderness to palpation, no fistula, no significant probing depth, and an apparently stable implants on both sites. However, a periapical radiograph revealed a radiolucency at the implant of mandibular right first molar site (Fig. 7). The patient had been under the systemic antibiotic therapy for three weeks until the clinical symptom disappeared. Four weeks after the surgery, pain subsided in spite of the size of radiolucent lesion increased (Fig. 8). It was planned to be checked up regularly because there was no symptom. Second stage surgery was done 4 months after the first stage surgery and the stability of involved implant was identified (Fig. 9). Though the periapical radiolucency still existed at the time of the placement of implant prosthesis (Fig. 10), the five-year follow up radiograph demonstrated its complete disappearance (Fig. 11).

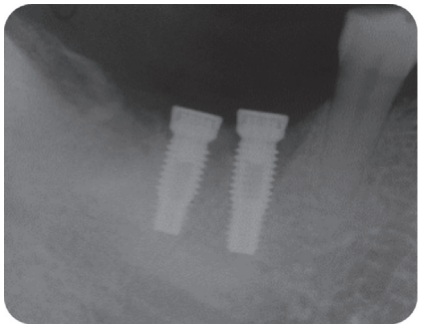

Fig. 6. Periapical radiograph when 1st stage surgery of two implantswas done three months after the extraction.

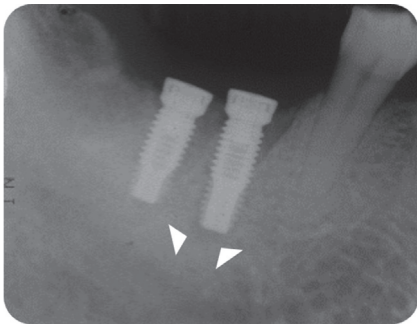

Fig. 7. Periapical radiograph revealed a radiolucency at the implant of mandibular right first molar site two weeks after the first stage surgery. Arrow heads depict the extent of IPL.

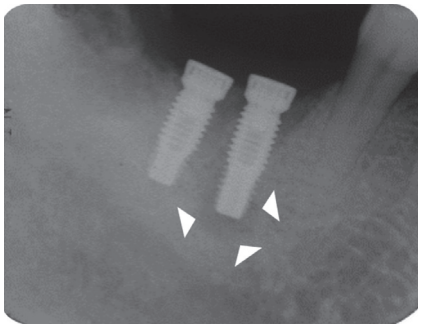

Fig. 8. Four weeks after the surgery, the size of radiolucent lesion increased.
Arrow heads depict the extent of IPL.

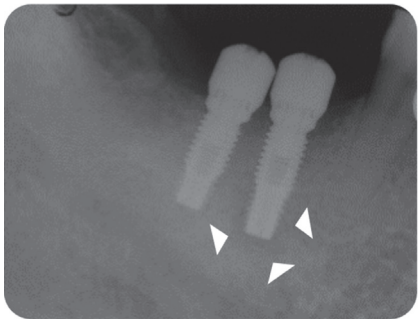

Fig. 9. Second stage surgery was done 4 months after the first stage surgery and the stability of involved implant was identified.
Arrow heads depict the extent of IPL.

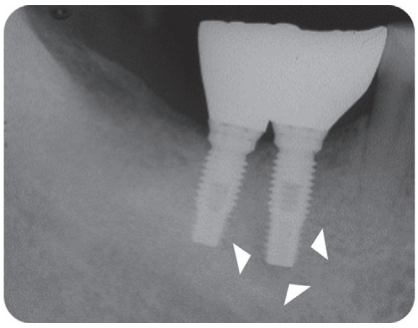

Fig. 10. The periapical radiolucency still existed at the time of the placement of implant prosthesis.
Arrow heads depict the extent of IPL.

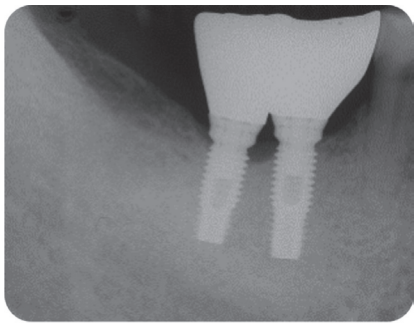

Fig. 11. Periapical radiograph of the five-year follow up demonstrating the complete disappearance of periapical lesion.

3. Case 3

A 45-year-old female patient was seen with a fractured tooth due to severe dental caries in the area of left mandibular first molar. Four months after the extraction, implant was placed by two staged approach showing good initial stability at the time of surgery (Fig. 12). Three weeks later, the patient complained of pain on surgical area. Clinical examination revealed that adjacent second premolar was positive to percussion with no other clinical findings specifically. However, periapical radiographs showed a radiolucent lesion around the apex of the implant and the periodontal ligament widening of the adjacent mandibular left second premolar (Fig. 13). The patient had systemic antibiotic therapy for two weeks, which leaded to decreasing of pain five weeks after the surgery. Considering the size of IPL had increased on a radiograph and still remaining discomfort, however, surgical approach was chosen (Fig. 14). The surgical protocol comprised total debridement with the additional removal of the possibly infected apical portion of bone. During the surgery, implant stability test by resonance frequency analysis was performed and in-

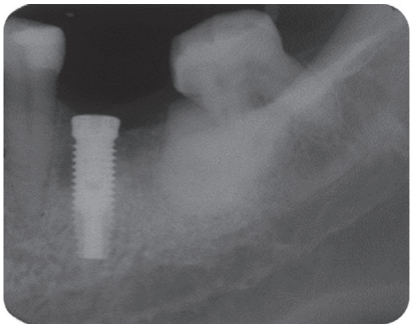

Fig. 12. Periapical radiograph of the time when implant was placed four months after the extraction.

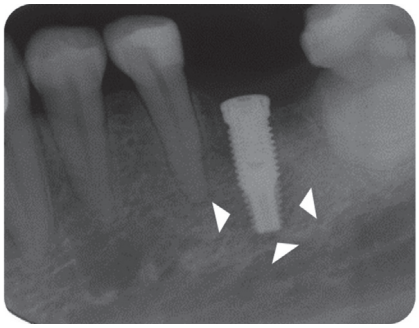

Fig. 13. Three weeks after the implant placement surgery, periapical radiographs showed a radiolucent lesion around the apex of the implant and the periodontal ligament widening of the adjacent mandibular left second premolar.
Arrow heads depict the extent of IPL.

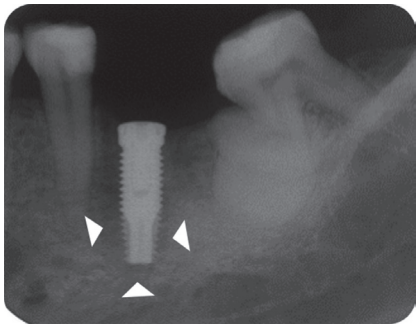

Fig. 14. Five weeks after the surgery, the size of IPL had increased on a radiograph with remaining discomfort.
Arrow heads depict the extent of IPL.

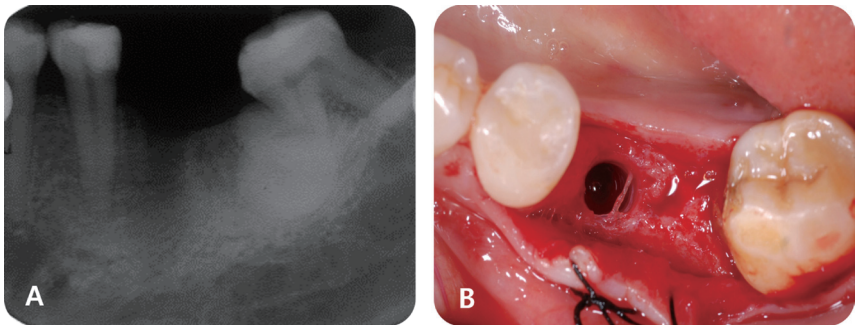

Fig. 15. The implant was removed due to the significant mobility during open flap debridement around the lesion. Periapical radiograph (A) and clinical photograph (B) after the explantation.

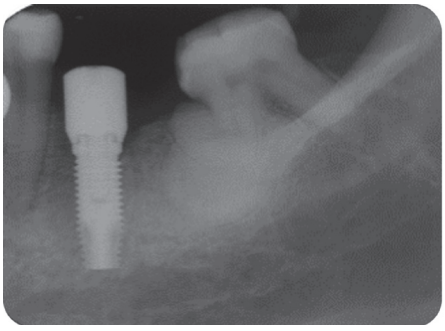

Fig. 16. Three months after the explantation, implant was replaced by one stage surgery.

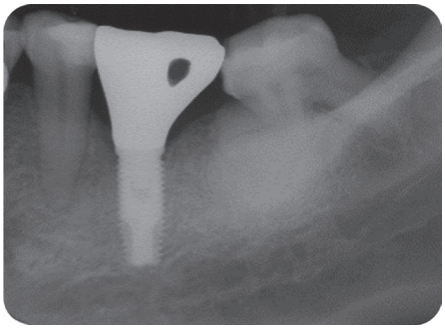

Fig. 17. There was no recurrent of IPL with good implant stability by the time of the six-year follow up.

dicated significant mobility of implant fixture. Thereafter, a decision was made to remove the implant (Fig. 15). The specimen from the lesion was fixed in 10% buffered formalin, processed to obtain thin ground sections and stained. The histological examination showed the infiltration of chronic inflammatory cells without any signs of bacterial invasion. Three months after the explantation, implant was replaced by one stage surgery showing to maintain good stability without any complication (Fig. 16) by the time of the six-year follow up (Fig. 17).

Discussion

The incidence of IPL is quite low. Reiser and Nevins[7] have reported that the incidence of IPL was 0.26% (10 out of 3,800) and had occurred more in maxilla than in mandible, especially in maxillary premolar areas.[8] Stephen et al.[3] have reported that the incidence was 9.9% (39 out of 395) and symptomatic lesions were 66.7%. Among those who had implant therapy in department of periodontics, Gangneung-Wonju National University Dental Hospital, the incidence of IPL was 0.66% (15 out of 2,289) and occurred six times more in mandible than in maxilla.

IPL is divided into the inactive form and the infected form according to the clinical symptoms.[7] The inactive form may be similar to the periapical scar without any clinical symptom. There is no need to treat in this form but need to check out by the regular radiographs.[1] The infected form can be caused by implant installation next to the preexisted infected lesion,[9,10] implant contamination,[9,11,12] bone necrosis related to overheating or other injury[13,14] and bony microfracture due to premature loading.[9] This form usually has various clinical symptoms such as pain, induration, swelling and fistula formation.[7]

IPL can be also subclassified into type I (from implant to tooth) and type II (from tooth to implant) depending on pathologic pathways.[15] Possible caus-

ative factors for type I can be too short distance between drilling site and the tooth, overheating, direct damage on the root and disturbing blood supplying to the pulp.[6,16-18] Type II lesion can be formed when installed implant contacts with the periapical lesion originated by adjacent non-vital tooth.

In general, treatment strategy of IPL depends on the source of infection. For example, if IPL was caused by adjacent periapical lesion related to non-vital tooth, it should be required to treat adjacent natural tooth as well as implant lesion. Mombelli and Lang[19] suggested that systemic antibiotic therapy could be required if stable implant showed suppuration. The clinical condition could be significantly improved after systemic antibiotic therapy without any additional treatment. They recommended antibiotic agents such as metronidazole which would act against anaerobic bacteria in IPL case. Kao et al.[20] suggested the combined administration of amoxicillin and metronidazole for ten days could be effective.

Some researchers showed several successful reports in regard to systemic antimicrobial therapy combined with surgical approach using bone graft materials with or without barrier membrane in infected form of IPL.[7,11] However, these combined therapies are simply based on some case reports or clinical experiences, not being established yet specifically. The main purpose of the surgical treatment in IPL is the removal of granulation tissue and bacteria on the surface of the involved implant.

If the infected area is only limited to apical area not compromising the supporting bone length around implant, the implant can be retained with the resection of infected implant apex (Implant apicoectomy). If the lesion is small and inactive, there is no need to resect preventively.[7] The most determining factor could be the complete debridement of the involved lesion. Implant apicoectomy procedure is one of the effective therapies to maintain IPL involved implant providing stable osseointegration without additional complications.[3] According to Reiser and Nevins,[7] however, it is recommended that the implant presenting the increased mobility and periapical radiolucency should be removed not to jeopardize any structures around it.

We classified the cases into either the infected or the inactive form depending on the presence of the clinical symptoms in this study. In the first patient case, we determined it as the inactive form of IPL and no treatment was done because there was neither clinical symptom nor functional problem. Although the radiolucency has continued to exist, there was no clinical problem with good stability up to the most recent twelve year-follow up.

However, the second patient had been under the systemic antibiotic therapy for three weeks until the clinical symptom disappeared because we determined it as the infective form with stable implant. As the pain subsided after systemic antibiotic therapy without any additional treatment, he was planned to be checked up periodically and the five-year follow up radiograph demonstrated the complete disappearance of the radiolucency.

In the third patient case, we also determined it as infected form because it produced pain and clinical symptoms and had the patient under the systemic antibiotic therapy for two weeks. In spite of that, the size of IPL increased on a radiograph and the patient still complained of remaining discomfort. As the next step, we chose the systemic antibiotic therapy combined with surgical approach. However, the implant failed to maintain stability after the surgical therapy and was removed later as suggested by Reiser and Nevins.[7] Implant was replaced at the same area three months after the explantation, which is showing good stability without any complication by the time of the six-year follow up.

Conclusion

IPL, one of the causes of the failure in implant dentistry has been worried by many clinicians. Although definite etiologic factor of IPL has not revealed yet, preexisted bacterial pathogenecity and surgical trauma such as bone heating seem to be mainly contributable. Therefore, it is important to minimize surgical trauma resulting bone heating during the surgery and to properly treat the possible infection source such as non-vital tooth prior to the surgery. It is also required to detect IPL in early

stage before jeopardizing the stable implant and surrounding bone structure and manage properly using systemic antibiotic therapy and surgical approach if needed, depending on infected form and inactive form. Further studies would be necessary to find out definite etiology and to provide well-defined therapeutic approach.

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References

1. Oh TJ, Yoon J, Wang HL. Management of the implant periapical lesion: a case report. Implant Dent 2003;12:41-6.
2. Adell R, Lekholm U, Rockler B, Brånemark PI. A 15 year study of osseointegrated implants in the treatment of the edentulous jaw. Int J Oral Surg 1981;10:387-416.
3. Stephen F. Balshi, Glenn J. Wolfinger, Thomas J. Balshi. A retrospective evaluation of a treatment protocol for dental implant periapical lesions: long-term results of 39 implant apicoectomies. Int J Oral Maxillofac Implants 2007;22:267-72.
4. Esposito M, Hirsch J, Lekholm U, Thomsen P. Differential diagnosis and treatment strategies for biologic complication and failing oral implants: a review of the literature. Int J Oral Maxillofac Implants 1999;14:473-90.
5. Misch CE. Density of bone: effect on treatment plans, surgical approach, healing, and progressive bone loading. Int J Oral Implantol 1990;6:23-31.
6. Sussman HI, Moss SS. Localized osteomyelitis secondary to endodontic implant pathosis. A case report. J Periodontol 1993;64:306-10.
7. Reiser GM, Nevins M. The implant periapical lesion; etiology, prevention, and treatment. Compend Contin Edu Dent 1995;16:768-77.
8. Park SH, Sorensen WP, Wang HL. Management and prevention of retrograde peri-implant infection from retained root tips: two case reports. Int J Periodontics Restorative Dent 2004;24:422-33.
9. Meffert RM. Periodontitis vs. peri-implantitis: the same disease? The same treatment? Crit Rev Oral Biol Med 1996;7:278-91.
10. Balshi TJ, Pappas CE, Wolfinger GJ, Hernandez RE. Management of an abscess around the apex of a mandibular root form implant: clinical report. Implant Dent 1994;3:81-5.
11. McAllister BS, Masters D, Meffert RM. Treatment of implants demonstrating periapical radiolucencies. Pract Periodontics Aesthet Dent 1992;4:37-41.
12. Shaffer MD, Juruaz DA, Haggerty PC. The effect of periradicular endodontic pathosis on the apical region of adjacent implants. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1998;86:578-81.
13. Eriksson RA, Adell R. Temperatures during drilling for the placement of implants using the osseointegration technique. J Oral Maxillofac Surg 1986;44:4-7.
14. Watanabe F, Tawada Y, Komatsu S, Hata Y. Heat distribution in bone during preparation of implant sites: heat analysis by real time thermography. Int J Oral Maxillofac Implants 1992;7:212-9.
15. Sussman HI. Periapical implant pathology. J Oral Implantol 1998;24:133-8.
16. Sussman HI. Tooth devitalization via implant placement: a case report. Periodontal Clin Investig 1998;20:22-4.
17. Sussman HI. Cortical bone resorption secondary to endodontic implant pathology. A case report. NY State Dent J 1997;63:38-40.
18. Brisman DL. The effect of speed pressure, and time on bone temperature during the drilling of implant sites. Int J Oral Maxillofac Implant 1996;11:35-7.
19. Mombelli A, Lang NP. Antimicrobial treatment of peri implant infections. Clin Oral Implants Res 1992;3:162-8.
20. Kao RT, Curtis DA, Murray PA. Diagnosis and management of peri implant disease. J Calif Dent Assoc 1997;25:872-80.

임플란트 근단 병소의 임상적 접근 방법: 5 – 12년간의 증례 보고

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이 증례 보고의 목적은 임플란트 근단병소를 가진 임플란트를 다양한 임상적 치료 적용 후 5 - 12년간 관찰하여 효과적인 임상적 접근 방법을 제시하고자 한다. 세 명의 환자 중 한 명은 병적 증상이 관찰되지 않아 비활성형(inactive form)으로 진단하고, 부가적인 치료 없이 주기적 관찰을 시행하였다. 두 명의 환자는 통증을 호소하여 감염형(infected form)으로 진단하고, 2 - 3주간 전신적인 항생제를 처방하였다. 한 명은 증상이 개선되어 주기적인 관찰을 시행하고 있으나, 다른 한 명에서는 임플란트 근단병소의 크기가 증가하고 통증의 개선도 보이지 않아 임플란트를 제거한 후 재식립 후 보철치료를 완료하였다. 세 환자 모두 현재까지 기능적 이상 없이 임플란트를 사용하고 있다. 임플란트 근단병소의 발생을 예방하기 위해서는 수술 과정 중 골 괴사를 유발할 수 있는 과열 등의 수술적 외상을 최소화하는 것이 필요하며, 임플란트 근단병소가 발생하였을 경우에는 조기 진단을 통해 적절한 전신적 항생제 처방이나 필요한 경우 외과적 처치를 통해 임플란트의 성공을 높일 수 있을 것으로 생각된다.

(구강회복응용과학지 2015;31(2):150-7)

주요어: 치과용 임플란트; 임플란트 주위염; 합병증; 근단병소

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