

Acute Fascial Space Abscess upon Dental Implantation to Patients with Diabetes Mellitus

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As popularity of dental implantation is increasing, the number of cases associated with complications also increase. Evaluation on diabetes mellitus is often neglected due to the disease's irrelevance to implantability. However, patients with diabetes mellitus are susceptible to infection due to impaired bactericidal ability of neutrophils, cellular immunity and activity of complements. Due to this established connection between diabetes mellitus and infection, a couple of cases were selected to present patients with diabetes mellitus with glycemic incontrollability, suffering from post-implantation dentigerous inter-fascial space abscess.

Key Words: Deep neck abscess; Diabetes mellitus; Implant complication; *Klebsiella pneumoniae*

Introduction

As popularity of dental implantation is increasing, the number of cases associated with complications also increase. While there are plenty of researches on locally manifested etiological causes of dental implant failure, systemic causes have barely been studied and reported. In clinical settings, there is insufficient evaluation of systemic factors prior to implantation procedure. Evaluation on diabetes mellitus is often neglected as well, due to the disease's irrelevance to implantability in contrast

to other conditions involved with administration of anticoagulant formulation and bisphosphonate formulation associated with bisphosphonate-related osteonecrosis of the jaw (BRONJ) which have direct association with implantability.

Being the most common systemic disease affecting infection of deep neck, diabetes mellitus hinders immunity¹⁾ and causes prolonged healing with poor prognosis¹⁾. Also, high blood-sugar contents activate salivary germs affecting dull recovery along with collagenic metabolism that is essential for healing of intra-oral tissues²⁾.

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Received for publication May 4, 2015; Returned after revision July 17, 2015; Accepted for publication August 15, 2015

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Due to this established connection between diabetes mellitus and infection, a couple of cases were selected to present in this article which include patients with diabetes mellitus with glycemic incontrollability, suffering from post-implantation dentigerous inter-fascial space abscess.

Cases Report

1. Case 1

A 57-year-old female patient visited our department on December 6, 2013 with chief complaint of constant pain and gingival edema around first premolar and first and second molars in the right side of mandible. The patient received de-grafting surgery two days ago for removal of graft materials. Pus discharge and swelling from the implanted sites on the right side of mandible was clinically observed. Medical history revealed presence of systemic diseases that are diabetes mellitus and high blood pressure. Upon panoramic examination, no abnormal finding was evident in terms of bone destruction and trabecular arrangement. Upon the visit, the patient had blood-sugar content of 283 mg/dl on condition of 6-hour fasting. With no improvement observed after abscess drainage and administration of antibiotics, the patient was hospitalized for four days since the visit.

Upon hospitalization, the patient underwent enhanced-computed tomography (CT) and was diagnosed with formation of abscesses on temporal space, right parapharyngeal space, submandibular space, masticatory space and pterygomandibular space in the right side (Fig. 1). Acute infection was evident upon blood test resulting in white blood cell (WBC) count of $15,100/\text{mm}^3$ and C-reactive protein (CRP) count of 33.83 mg/dl. With glycated hemoglobin sitting at 9.8%, it was concluded that the patient was suffering from glycemic incontrollability.

Upon establishment of glycemic control by joint treatment with the department of internal medicine, the patient began to received antibiotic treatment with ampicillin with sulbactam sodium. On second day since hospitalization, the patient received incision and drainage (I&D) with intra-oral approach under general anesthesia resulting in improvement in right buccal edema. Temporal flare and edema were further observed thereafter, followed by laterocranial extra-oral pyorrhea two days after incision. The day after I&D procedure, swelling on the right buccal area was subsided but redness and edema were observed on the temporal area. On the following day, extra-oral sinus tract was formed then I&D on temporal and buccal area was performed by extra-oral approach under general anesthesia and WBC count and CRP count

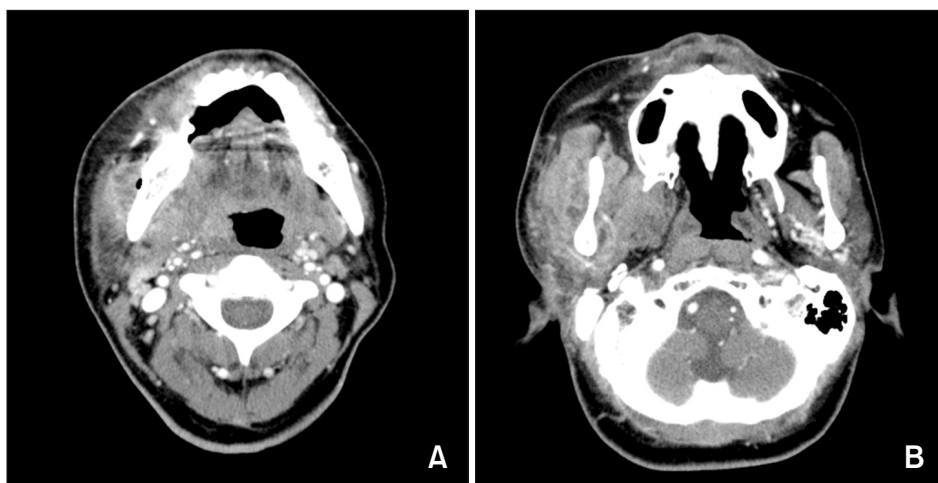


Fig. 1. (A) Abscesses of submandible and parapharyngeal space are observed. (B) Abscesses of submassetatory and pterygomandible space are observed.

decreased continuously.

According to the blood test conducted at Day 26 since hospitalization, the patient had WBC count and CRP count of $4,100/\text{mm}^3$ and 1.37 mg/dl and respectively local abscess at extra-oral temporal area was clinically observed. All drainage tubes except on the temporal area were removed and the patient discharged from the hospital at Day 30 since hospitalization.

2. Case 2

A 73-year-old female patient, visited our department with chief complaint of constant pain and submental edema after implantation procedure on right mandibular central incisor.

Severe submental edema was clinically observed as the patient complained about dyspnea and dysphagia. Upon the panoramic examination, no abnormal finding around implanted parts was evident in terms of osteoclasia, etc. CT was required for the evaluation of implantation site. However, due to presence of dyspnea, the patient was classified into emergency state and diagnosis was made as sublingual and submental space abscess. Upon hospitalization due to dyspnea, the patient underwent enhanced-CT and the diagnosis

was confirmed to be abscesses in sublingual space and submental space (Fig. 2). Acute infection was evident upon blood test resulting in WBC count of $8,990/\text{mm}^3$ and CRP count of 21.37 mg/dl .

With fasting blood glucose level and glycated hemoglobin sitting at 317 mg/dl and 11.7% , respectively, the patient was concluded to be suffering from glycemic incontrollability. On the same day, the patient received general anesthesia for I&D via exodontic route.

Upon I&D, the patient received blood glucose control and antibiotic treatment with Sulbacillin, by joint treatment with the department of internal medicine.

Submental flare and edema decreased from Day 1 since I&D, with improvement of WBC count and CRP count measured at $4,650/\text{mm}^3$ and 4.32 mg/dl upon blood test conducted at Day 4 since I&D. With bare manifestation of clinical symptoms, the patient underwent cone-beam CT (CBCT) scan at implanted sites and was discharged at Day 7 since I&D.

The CBCT scan revealed perforated lingual cortical bone on the mandible which occurred during the previous dental implantation procedure (Fig. 3).



Fig. 2. Abscesses of submental and sublingual space are observed.



Fig. 3. The perforation of lingual cortical bone is observed.

Discussion

Diabetes mellitus is one of the most common chronic diseases with drastic increase in its morbidity rate all across the world varying by nation, race and living environment as a result of economic prosperity, extended life expectancy and Westernized lifestyle³⁾.

The ADA (American Diabetes Association) diagnosis criteria for diabetes, as suggested by the professional committee of the Association on Year 2000, states 8-hour fasting blood glucose level in venous plasma to be 126 mg/dl or higher and randomly measured blood glucose level in venous plasma to be 200 mg/dl or higher with some of the most typical diabetic symptoms such as polyuria, thirst and loss of body weight. However, the Association also suggests re-measurement when blood glucose level in venous plasma exceeds 200 mg/dl in two hours after 75-gram oral glucose tolerance test (OGTT) as it turns out to be vague. Blood glucose level below 100 mg/dl with and venous plasma below 140 mg/dl are accepted to be normal.

A patient of diabetes mellitus is susceptible to infection due to impaired bactericidal ability of neutrophils, cellular immunity and activity of complements^{1,3)}. The patients with diabetes mellitus who have infection on deep neck may give rise to serious complications such as mediastinitis, empyema, pericarditis, pericardial effusion, epidural inflammation, thrombus on internal jugular vein and septic shock^{4,5)}, presented with prolonged healing and poor prognosis compared to patients without diabetes¹⁾. It is also reported that diabetes mellitus accounts for the greatest part of systemic diseases associated with oral and maxillofacial fasciitis^{6,7)}.

A surgical guideline of dental implantation to patients with diabetes covering specific details such as type of diabetes, time of onset and long-run metabolic controllability is yet to be established.

Fiorellini and Nevins⁸⁾ reported that diabetes mellitus hinders osseointegration of dental implant. Upon now, the greater part of diabetes mellitus researches have focused on osseointegral success without any specific guideline of post-implantation infection. In addition, most of the review articles reporting post-implantation complications do not consider the acute abscess⁹⁾.

Both cases presented in this article demonstrated acute inter-fascial space abscess upon dental implantation. The patients in both cases received dental implantation while blood sugar level remained uncontrolled. Acute infection and the symptom of fascial abscess such as facial swelling showed up within 10 days after dental implantation. Emergency state such as dyspnea occurred and scar tissue on face was formed due to extra oral I&D under general anesthesia. In particular with case 1, drainage through sinus tract on buccal area was performed that caused formation of severe dent on right facial area.

In case 1, dental implantation of posterior tooth area was done 1 week prior and yet infection wasn't observed at that time. Uncontrollable state of blood glucose level is not the contraindication of dental implantation. It is reported that patients with high HbA1c level are susceptible to infection and compromised healing¹⁰⁾. High blood glucose level itself can induce compromised immunity and the susceptibility to infection depends on controllability of blood glucose level^{1,3)}. Therefore, control of blood glucose level before dental implantation is a crucial factor for successful treatment.

According to bacterial identification of the cases in this article, *Klebsiella pneumoniae* and *Streptococcus anginosus* were identified from the case 1 and case 2, respectively. They are known to be few of the most common germs identified from the patients with deep neck infection and it is reported that *K. pneumoniae* is the most commonly identified germ out of the patients with diabetes who have infection on deep neck^{1,11)}. As the pathogenicity of

K. pneumoniae is determined by macrophages of the host, prognosis may get worse in case of impaired immunity or increased blood-sugar content. It is also reported that patients should endure more extensive hospital treatment if *K. pneumoniae* is identified¹⁰. It was demonstrated in case 1 where identification of *K. pneumoniae* endured more extensive hospital treatment with more severe inflammation. Case 1 involved with a couple of surgical operations under general anesthesia followed by 30-day hospitalization whereas case 2 involved with a single surgical operation under general anesthesia allowing patient to be cured followed by 10-day hospitalization.

Being a metastatic host, *K. pneumoniae* is commonly metastasized to lung, liver, digestive system and eyes¹². Pulmonary infection is identified from case 1, followed by evaluation on infection of liver, digestive system and eyes. It was also confirmed that *K. pneumoniae* is tolerant against ampicillin. This is why use of antibiotics containing β -lactamase inhibitor must be considered concomitantly with administration of ampicillin when considering *K. pneumoniae* is frequently identified from patients with diabetes mellitus¹³.

According to CBCT scan, case 2 was evident to have perforated lingual cortical bone on the mandible which occurred during the past dental implantation. Sublingual areas feature with complicated anatomical structures such as lingual nerve, etc. for that reason, we need to pay a particular attention upon surgical operation procedures. Yang et al.¹⁴ reported that perforated lingual cortical bone during dental implantation gives rise to damaged sublingual artery which can be, followed by sublingual bleeding and respiratory obstruction. The infection does not always occur under the condition of perforated lingual cortical bone. However, both cases presented in this article with characteristic of uncontrolled blood-glucose level gave rise to impaired immunity by which perforated lingual cortical bone served as

an infection medium that brought about fascial infection.

It is difficult to identify definite local causes of fascial infection in both cases. Although there was a possible cause of perforated cortical bone in case 2, no assumable local infection factor was in case 1. Therefore, it was assumed that systemically compromised immunity due to uncontrolled diabetes mellitus accounts for major cause of infection. Reports on immediate infection after dental implantation without any specific causes other than diabetes mellitus are rare. Therefore, recommendation from this case report is that we should not overlook controllability of blood-glucose level prior to dental implantation surgery as it can induce fascial infection without any other specific local factors.

Patients who have diabetes mellitus with uncontrolled blood-glucose level present with decreased immunity thus, susceptible to infection. Due to this established connection between diabetes mellitus and infection, it is deemed essential to conduct thorough medical history taking and confirmation of blood-glucose controllability prior to dental implantation and other surgical treatments.

As we see in the cases above, infection occurred after dental implantation in the patients with diabetes mellitus can proceed to space abscess and retard the healing.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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