Reconstruction of Defect after Treatment of Bisphosphonate-related Osteonecrosis of the Jaw with Staged Iliac Bone Graft

Kyo-Jin Ahn, Young-Kyun Kim, Pil-Young Yun

Department of Oral and Maxillofacial Surgery, Section of Dentistry, Seoul National University Bundang Hospital

Abstract

Bisphosphonate is used widely for osteoporosis treatment, but a rising concern is the risk of osteonecrosis after long-term bisphosphonate use. Such cases are increasing, suggesting a need for research to prevent and treat bisphosphonate-related osteonecrosis of jaws. A 63-year-old female took bisphosphonate (Fosamax®) for four years for treatment of osteoporosis and stopped medication two months ago because of unhealed wound. She was treated with marginal mandibulectomy maintaining the inferior border, and a metal plate was placed to prevent mandible fracture. Four months after the mandibulectomy, mandible reconstruction surgery using iliac bone and allograft was done. Six months after reconstruction, implant placement and treatment with an overdenture was done without complications. This study presents a case with a successful result.

Key words: Bisphosphonate-related osteonecrosis of jaws, Osteonecrosis, Implant, Overdenture

Introduction

Bisphosphonate is used to prevent pathological fracture resulting from osteoporosis or the bone metastasis of malignant tumors. Bisphosphonate-related osteonecrosis of jaws (BRONJ) was first reported by Marx[1] in 2003, and cases are increasing across the world, including Korea. It raises concern as a new disease in the oral and maxillofacial area, and research is active. The essence of BRONJ has not been accurately identified except that it is rare. Once BRONJ occurs, however, it is difficult to treat, making prevention the preferred approach for high-risk patients.

The American Association of Oral and Maxillofacial Surgeons presented guidelines in 2006 and 2009 regarding BRONJ[2,3] and in Korea, the Korean Endocrine Society, Korean Society for Bone and Mineral Research, The Korean Society of Osteoporosis and The Korean Association of Oral and Maxillofacial Surgeons jointly presented guidelines in 2009 on BRONJ risks, prevention and therapies[4]. According to these guidelines, a case may be defined as BRONJ if all the following conditions are satisfied.

- When bone is exposed on the jaw region and the symptoms continue for more than eight weeks without healing despite appropriate treatment.
- When the patient took bisphosphonate in the past or is currently taking it.
Case Report

In September 2009, a 63-year-old female patient presented for treatment of a mandibular anterior swelling and delayed wound healing. The patient’s right mandibular canine and primary premolar were extracted four months earlier at a dental clinic. However, the wound had not healed, with continued exposure of the extraction socket, gingival swelling, spontaneous pain, and sensory paralysis. The patient said that she started taking bisphosphonate (Fosamax®, Merk, Whitehouse Station, NJ, USA) four years ago to treat osteoporosis but stopped two months ago. In the computed tomography image, an osteolytic lesion was observed on the right mandibular body and the symphysis, and the bone scan showed increased hot uptake in the same region. We provisionally diagnosed it as BRONJ and performed marginal mandibulectomy on #33–45 region preserving mandibular inferior border on September 30, 2009. In addition, reconstruction metal plates were used to prevent bone fracture. Two months after the surgery, all related symptoms were resolved. In January 2010, we executed mandibular reconstruction using autogenous iliac bone and allogeneic bone graft (DBX putty; Synthes, Paoli, PA, USA). The first surgery was done with two implant placements in July 2010, and the second surgery was performed in November 2010. Finally, the overdenture was delivered in December 2010. For the 23 months since, the implants are functioning successfully without complications (Fig. 1–5).
Discussion

In this case, BRONJ was diagnosed in a patient who took bisphosphonate for four years. Most researchers agree that the risk of BRONJ is lower with oral bisphosphonate than when injection bisphosphonate is used. However, there is a significant difference of opinion regarding the incidence rate of necrosis of the jaw from oral bisphosphonate. The reported incidence rate of BRONJ resulting from Pamidronate (Aredia; Novartis, East Hanover, NJ, USA) and Zoledronate (Zometa; Novartis), the representative bisphosphonate injections, is 6.7%, extremely high[7]. Most research reports that the risk from bisphosphonate injections is high, but Mattheos et al.[8] re-
Sedghizadeh et al. [13] reported that there was jaw necrosis in case of oral bisphosphonate intake[9-12]. However, for overall dental treatment including implant placement it is not necessary to choose particularly conservative treatment. American Dental Association recommended in 2008 that it is not an absolute contraindication for implant placement. The BRONJ incidence rate when oral bisphosphonate was administered was 0% to 0.04%, lower than that of injection bisphosphonate, and even the bisphosphonate was administered was 0% to 0.04%, lower than that of injection bisphosphonate. This case also shows jaw necrosis developing in a patient taking oral bisphosphonate with history of extraction. Many other researchers reported that large numbers of BRONJ patients had extraction history, concluding that extraction raises the risk of BRONJ[13-15]. Thus, even if oral medicine is used, the patient and physician should be aware of the risk of osteonecrosis or failure of implant prior to implant placement when bisphosphonate is administered for more than three years[4]. Furthermore, the American Association of Oral and Maxillofacial Surgeons and a joint position statement of Korean domestic societies recommended that bisphosphonate be stopped for three months prior surgical procedures if bisphosphonate was administered for more than three years, or if steroid was administered simultaneously when if intake is less than three years[3,4]. However, there is no evidence that this will improve surgical outcomes.

BRONJ treatment has long been controversial. While conservative treatment is recommended[10], recent studies say that early surgical treatment might be more effective[16,17]. According to the stage and therapeutic strategies presented in 2009 by the American Association of Oral and Maxillofacial Surgeons, BRONJ is classified into four stages along with therapeutic strategies. The 0 stage is that patients complain about non-specific symptoms without any necrotized bone, undergo symptomatic treatment, and antibiotics if needed. The first stage is when there is an exposure of the necrotized bone but no symptoms and no evidence of infection. In this stage, oral irrigation is executed by sterilized oral cleaner (chlorhexidine) and no surgery is needed. The second stage is when there is evidence of pain and infection along with the exposure of the necrotized bone, Oral antibiotics are necessary, oral irrigation is carried out using sterilized oral cleaner, and only the surface layer has to be removed from the necrotized tissue. The third stage occurs when the exposed region of the necrotized bone crosses over the alveolar bone, with accompanying pathological fracture, extra-oral fistula, oro-nasal fistula or sinus tract is formed, or osteolysis has progressed below the mandibular. In this stage, it is necessary to administer general antibiotics and remove the necrotized bone along with oral irrigation[3]. Of these stages, surgical procedure can be considered in the second and third stage. This case is classified as third stage, and it was possible successfully heal bone through early surgical treatment. After bone healing, implants may be placed and the overdenture can function successfully using these implants. We performed staged reconstruction in this case with reconstruction done four months after mandibular resection. In staged reconstruction, the risk of secondary infection is less, there can be sufficient healthy tissue to cover the graft area, and the patient can be in optimal condition for additional surgery. Moreover, surgeons can reassess the esthetic result of reconstructive plan. On the other hand, there are disadvantages of re-approaching the surgical site, with scarring and loss of space to accommodate a reconstruction[18,19]. In this case, the overdenture was delivered after placement of two implants on the mandible, If a conventional denture was used without any implant placement, the denture could not be sufficiently retained. Because the denture continuously stimulates the inferior mucous membrane, there could be damage and ulceration of soft tissue, followed by possible exposure of the bone with a risk of secondary infection. In addition, continuous atrophy may occur on the edentulous region. However, in this case, since implants were placed and the implant-supported overdenture functioned successfully, it was possible to overcome all such problems.

References