



## Case Report

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# Plasma Therapy for Medication-Related Osteonecrosis of the Jaws- A Case Report



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**Running Title** Osteonecrosis of Jaw and Plasma Therapy of It



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## ABSTRACT

Medication-related osteonecrosis of the jaw (MRONJ) is a side effect of anti-bone resorption medications. Nowadays antiresorptive medications like bisphosphonate and monoclonal antibodies like denosumab that have been prescribed for bone disorders and metastatic cancer are becoming increasingly common. Although these medications are quite efficient at reducing bone resorption, they can develop osteomyelitis and jaw necrosis as a side effect.

A 65-year-old woman was referred to the Oral Medicine Department of Semnan University of Medical Sciences with diffuse bilateral mandibular osteonecrosis, with a history of osteopetrosis and under-treatment of bisphosphonate. This complication started after tooth extraction and without any healing 5 years ago. After 3 sessions of plasma therapy, obvious improvement was seen.

A proper medical history and a routine oral examination before treating with any invasive dental treatment are necessary to avoid any medication-related osteonecrosis of the jaw or mucosal abnormalities.

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## Introduction

**O**steopetrosis describes a collection of rare, inherited skeletal illnesses with aberrant bone development and increased bone density (1). Mutations in at least 10 genes have been linked to osteopetrosis. Vitamin D supplements, other drugs, and/or surgery may be used according to the symptoms and severity (2). Avascular necrosis (AVN), also known as osteonecrosis is bone tissue destruction caused by blood supply obstruction. It may be asymptomatic at first, but progresses with other symptoms like jaw pain, limited movement, bone fractures, and joint dislocations. Alcoholism, medications such as high-dose steroids and Bisphosphonates (BPs), radiation therapy, chemotherapy, cancer, lupus, sickle cell illness, and HIV infection are all linked to osteonecrosis of the jaws (3).

Osteoblasts create bone and osteoclasts destroy bone, thus keeping bone tissue equilibrium state (homeostasis). Bisphosphonates reduce bone loss by stimulating osteoclast apoptosis which inhibits bone breakdown. Bisphosphonates are used to treat osteoporosis, Paget's disease of the bone, bone metastases, osteopetrosis, and other congenital bone fragility diseases (4).

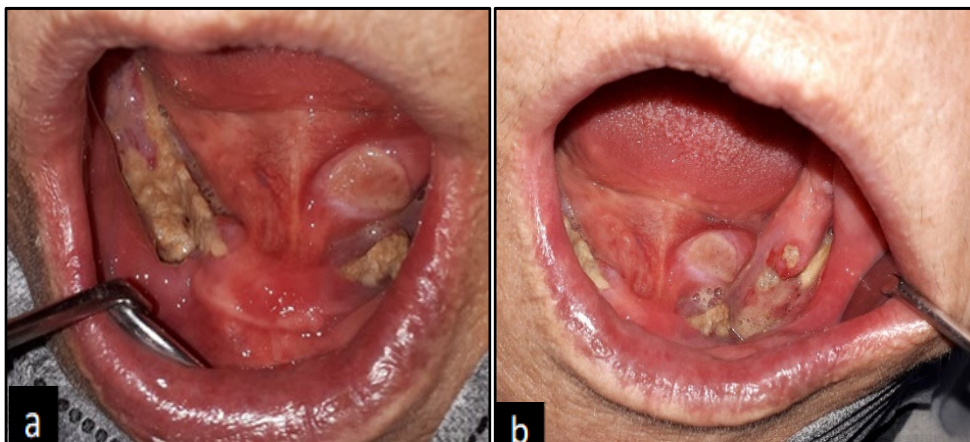
Medication-related osteonecrosis of the jaw (MRONJ) is becoming more common among patients taking bisphosphonates and other anti-bone-resorbing treatments and antiangiogenic therapies (5).

Antibiotics, antiseptic rinse, local debridement, and low-level laser irradiation may all help in treatment. Other new treatments such as hyperbaric oxygen therapy, teriparatide, and platelet-rich plasma have recently been studied. This paper presents a case of chronic Bisphosphonate-related osteonecrosis that responded to plasma therapy with a special bandage and cover.

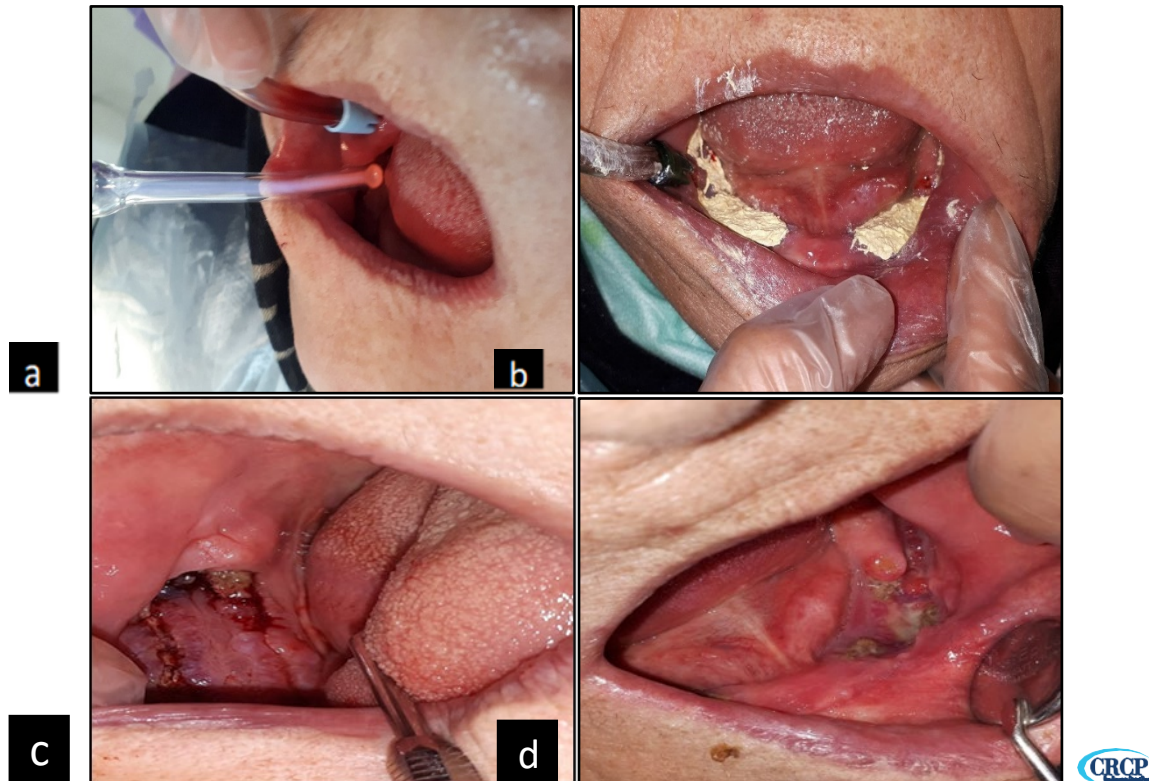
## Case Presentation

The patient was a 65-year-old woman, referred to the Oral Medicine Department of Semnan University of Medical Sciences with complaint of chronic osteonecrosis of the jaw for about 5 years. The patient had a history of osteopetrosis that was under treatment with bisphosphonate. This complication appeared after mandibular teeth extraction. In these 5 years, she was referred to many dentists. Surgical debridement and oxygen therapy were performed without any improvement or healing to the point that it even got worst. In extra-oral examination, there wasn't any significant finding. In intraoral examination, diffuse bilateral mandibular osteonecrosis was observed (about 33 to 38 and 43 to 48, with 1 cm width). The bone was completely exposed with a thick layer of puss on it (Figure 1).

For plasma therapy that was performed in 3 sessions, plasma was placed on disinfection mode for 7 minutes. Then it was put on anti-inflammation and wound healing mode for 7 minutes. Each time, before plasma delivery, the affected area was washed with chlorhexidine. After plasma therapy, a dry socket-like bandage was used to cover the exposed bone with Zonalin and Eugenol plus Tetracycline ointment (Figure 2a,2b). Improvement was significant after three sessions (Figure 2c,2d).



**Figure 1:** Diffuse bilateral mandibular osteonecrosis about 33 to 38 (a) and 43 to 48 (b).



**Figure 2:** Treatment procedures. Plasma therapy(a), dry socket-like bandage with Tetracycline ointment (b). Significant repair was seen in the bilateral mandibular region. c) right side, d) left side

## Discussion

Bisphosphonates are similar to synthetic pyrophosphate, a bone metabolism regulator found in abundance in the bone matrix (4). These chemicals prevent osteoclastic precursors from developing, cause osteoclast death, and induce osteoblasts to release osteoclastic inhibitory factors (7). Bisphosphonates have been proven in numerous clinical studies to decrease the incidence of pathological fractures, bone pain, hypercalcemia episodes, and the radiotherapy and surgery requirement in patients with osteolytic bone metastases (4). Our patient used this medication for osteopetrosis to increase bone density.

One of the side effects of using this medication is osteonecrosis of the jaw. (6). Use of corticosteroids, alcohol, infections, storage problems, coagulation deficiencies, and various autoimmune diseases have all been linked to osteonecrosis. However, a considerable number of cases of idiopathic osteonecrosis have been reported with no evident cause (8). BPs may increase the risk of local infection and possibly contribute to impaired healing of the oral mucosa (7), similar to our case presenting with a layer of puss on her exposed bone.

According to reports, majority of patients (69%) had their teeth extracted before developing osteonecrosis. This shows that this type of trauma can cause complications and can explain that when local defenses are overwhelmed by infection, trauma, or surgery, a wide

range of bacterial infiltration to the bone marrow can occur. Furthermore, angiogenesis restriction can exacerbate this process by limiting vascular supply by tissue cicatrization (9) that confirms our patient's problem as well with extraction of her teeth. Studies showed that the most common symptoms of osteonecrosis are pain, followed by purulent secretion, oroantral fistula, swelling, and fever (6).

Treatment could be antibiotic therapy with surgical processes as a first-line (9). In our patient, all treatments were ineffective because due to severity and prolongation. She needed strong and complete procedures. That's why we used plasma therapy with an antibiotic.

Plasma applications were divided into two categories: surface treatment and direct applications, and they were examined in order of approach. Previous reviews under the heading of surface treatment, showed the modification of dental implant surfaces, the enhancement of adhesive characteristics, the enhancement of polymerization, surface coating, and plasma cleaning. As direct applications, microbicidal activity, decontamination, root canal disinfection, and tooth bleaching were examined along with a variety of others. The prospect of using non-thermal atmospheric pressure plasma in living tissues drew a lot of attention, thus, it was granted special study. Plasma has shown promise in various areas of dentistry and is currently ushering in a new era of plasma dentistry (10).

In conclusion, antiresorptive medications are becoming increasingly common among elderly patients with osteoporosis, multiple myeloma, and metastatic cancer. A proper medication history must be taken before treating these patients for any invasive dental treatment. The physician should recommend a routine oral examination for these patients to check for any medication-related

osteonecrosis of the jaw (MRONJ) or mucosal abnormalities and other side effects. Any choice to stop taking an antiresorptive medicine and using the proper treatment in a suitable time and avoidance of development of complications should always occur in consultation

## Ethical Considerations

### Compliance with ethical guidelines

Patient signed informed consent before beginning the treatment and for taking images, and all of the treatment steps was in accordance with the appropriate ethical framework.

### Funding

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### Conflict of interest

There is no Conflict of interest in this study.

### Acknowledgements

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