

Consequence of Bisphosphonate on Dental Implant Success in Osteoporotic Females

Rawaa Y Al-Rawee^{1*}
Ali Mohammad Saeed²
Bashar Abdul-Ghani Tawfeeq¹

¹Department of Oral and Maxillofacial Surgery, Al-Salam Teaching Hospital, Mosul, Iraq
²Department of Oral and Maxillofacial Surgery, Al-Gemhoory Teaching Hospital, Mosul, Iraq

Abstract

Objective: To evaluate the effect of Bisphosphonate on Dental Implant failure rate in osteoporotic female patients.

Patients and Method: Fifteen osteoporotic female patients underwent surgery to place 72 fixtures, in upper jaw, loaded completely within 4 months. Patients take Alendronate tablet 10 mg once daily for 8 months, 2 months preoperative and 6 months postoperative. Compares with healthy females underwent implant surgery too.

Results: Six dental implants were failed at the time of second step surgery (Gingival Former Step), with no other complication faced by the patients whether related to drug used or to surgery. Three fixtures were failed in healthy females. Statistically no significant differences in the effect of bisphosphonate on dental implant failure.

Discussion: Patients who take oral Bisphosphonate are no more at risk of implant failure than normal patients with no drug use.

Keywords

Alendronate; Bisphosphonate; Implants; Postmenopausal

Introduction

Osteoporosis as a metabolic disease characterized by low bone mass and micro architectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in fracture risk (World Health Organization) [1]. Bone resorption-formation balance tips off towards the resorption more so weakness and breaking of the bone can occur [2].

Physiologically bone is constantly being rebuilt and goes through a balanced process of bone break-down and new bone formation. After menopause, and aging process; balance; is disrupted and loose bone faster than it is rebuilt [3]. Increased dietary calcium and vitamin D intake, smoking cessation, moderation of alcohol and caffeine consumption, regular weight-bearing exercise regimen, and regular outdoor activities, all these factors can reduce osteoporosis postmenopausal [4,5].

Bisphosphonate (bone-sparing drugs) are currently the first choice for the medical treatment of osteoporosis [6]. Bisphosphonate can be administered in two ways: orally and intravenously. Oral bisphosphonate are usually prescribed for osteoporosis, while intravenous bisphosphonates are typically prescribed for patients with advanced bone cancers to help decrease pain and fractures [7].

These drugs preserve bone by decreasing rate of bone turnover and enhancing bone mineralization. Optimal duration of therapy is average five years duration [7].

Bisphosphonate and Implants: In 10 studies, The authors concluded from the results that dental implants can osseointegrate and remain functionally stable in patients using Bisphosphonate [8]. Brian M. Bell stated that from the analysis of the one prospective and the three retrospective series (217 patients), the placement of an implant may be considered a safe procedure in patient taking oral bisphosphonate [9].

Objective

The purpose of this study is to determine whether patients who take oral bisphosphonate are at risk of implant failure or not by comparison done with healthy females.

Patients and Methods

Fifteen Female patients (50-71 years) prepared to underwent two steps dental implant surgery with Dentium Superline System. Patients were previously diagnosed to be in risk of osteoporosis and managed with oral bisphosphonate pre- and postoperatively. Each patient have its own case sheet with ethical approval signed by them. Seventy two fixtures were placed in upper jaw. Table 1 showed detailed clinical description concerning

Article Information

DOI: 10.31021/jddm.20192127
Article Type: Research Article
Journal Type: Open Access
Volume: 2 **Issue:** 1
Manuscript ID: JDDM-2-127
Publisher: Boffin Access Limited

Received Date: 30 January 2019
Accepted Date: 28 February 2019
Published Date: 04 March 2019

***Corresponding author:**

Rawaa Y Al-Rawee
BDS, MSc, MOMSRCPS Glasgow
(Ph.D.MaxFacs)
Department of Oral and Maxillofacial Surgery
Al-Salam Teaching Hospital
Al-Sukar, Mosul, Iraq
Tel: 009647726438648
E-mail: dr.rawarawi@yahoo.com

Citation: Al-Rawee RY, Saeed AM, Tawfeeq BAG. Consequence of Bisphosphonate on Dental Implant Success in Osteoporotic Females. J Dents Dent Med. 2019 Mar;2(1):127

Copyright: © 2019 Al-Rawee RY, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 international License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

No	Implant number	Site	Failure
1	4	Max side	
2	1	Ant	
3	6	Max full	1
4	6	Max full	
5	7	Max full	1
6	2	Ant	
7	5	Max side	
8	1	Ant	
9	8	Max full	1
10	6	Max full	
11	4	Max side	1
12	6	Max full	
13	2	Ant	
14	6	Max full	
15	8	Max full	2
	72		(6)(8.33%)

*Ant. Max.: Anterior site of maxilla; **Maxilla Side: Left or Right side of the Maxilla; ***Maxilla Full: Complete Maxillary bone (Edentulous Patients)

Table 1: Clinical description of Osteoporotic cases

site and number of fixtures placed and failed. All fixtures loaded completely within 4 months. Patients took Alendronate tablet 10 mg once daily for 8 months, 2 months preoperatively and 6 months postoperatively. Patients informed to take on an empty stomach, stay in upright position for half an hour. In addition to therapeutic treatment with bisphosphonate, patients advised to increase and concentrate the dietary intake of food containing calcium and vitamin D substitutes to compensate postmenopausal osteoporosis. On the contrary healthy female also underwent implant surgery with 100 fixtures distributed in both jaws. Fixtures distribution to sites for both osteoporotic and healthy cases has been shown in tables (Tables 2-4) (Figures 1 & 2).

The patients recalled for periodic follow-up appointment to examine their jaw and fixture. During examination, periodontal probing performed and pocket depths recorded. Panoramic and peri-apical radiographs taken to ensure that patients were not suffering from bone loss or jaw necrosis.

Result

Six dental implants (8.33%) from total 72 implants (Table 5) were failed (Figure 3) at the time of second step surgery (Gingival Former Step), with no other complication faced by the patients whether related to bisphosphonate (necrosis of the jaw) or to surgery.

Periodic follow up within five years, indicate stable, sound Implants in clinical examination, with normal physiologic

Site	Fixture. Number in Osteoporotic patients
Ant. Maxilla	6
Side of maxilla	13
Full Maxilla	53
Total	72

Table 2: Site Distribution in Osteoporotic Patients

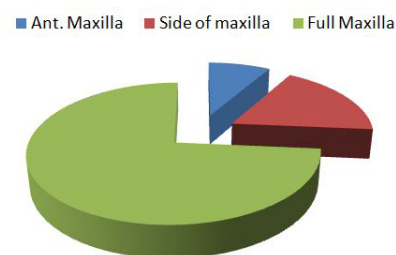


Figure 1: Site distribution in osteoporotic patients

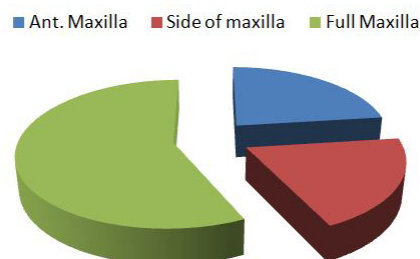


Figure 2: Site distribution in healthy patient

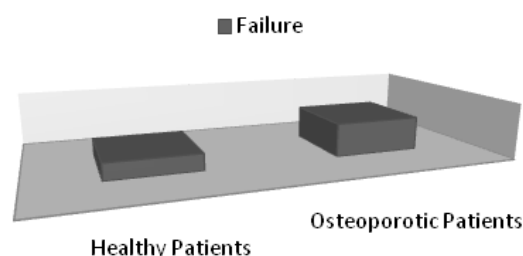


Figure 3: Failure rate in both type of patients

resorbed marginal bone surrounding the fixtures in radio graphical investigation, indicate a success rate of 91.7%. We compare failure rate in bisphosphonate females with those healthy females underwent implant surgery in same situation only differ in bisphosphonate use. Healthy females showed failure in three fixtures (3%) from total 100 fixtures (Table 5).

Statistical comparison (Table 6) done by using Mann-Whitney Test (Table 7), showed that no significance in Z value (-1.940).

Discussion

Bisphosphonate is a class of drug commonly used to decrease osteoclast activity and bone turnover, typically giving higher bone density. Postmenopausal period considered as one of the risk factors that indicate the use of oral Bisphosphonate.

There has been a long discussion regarding the risks associated with the performance of oral surgical procedures, particularly implant placement, on patients who are taking oral bisphosphonate.

Hewitt and Farah came to similar conclusions, recommending surgical treatment to be completed before the patient begins to take bisphosphonate, and preventative measures be taken afterward

No	Implant no.	Site	Failure
1	4	Max side	
2	3	Ant	
3	7	Max full	1
4	6	Max full	
5	7	Max full	1
6	3	Ant	
7	5	Max side	
8	3	Ant	
9	8	Max full	
10	7	Max full	
11	4	Max side	
12	6	Max full	
13	4	Ant	1
14	9	Max full	
15	7	Max full	
16	3	Ant	
17	4	Max side	
18	3	Ant	
19	3	Max side	
20	4	Ant	
	100		

Table 3: Clinical description of Healthy cases

Site	Fixture number in Healthy patients
Ant. Maxilla	23
Side of Maxilla	20
Full Maxilla	57
Total	100

Table 4: Site distribution in Healthy patients

	Success	Failure	Total
Osteoporotic patients	66	6	72
Healthy patients	97	3	100

Table 5: Success and Failure rate

Cases	Number	Percent of Frequency	0* 1**
Healthy	100	35.0	0.7
Osteoporotic	72	23.6	2.1

0*: No Mobility of Fixture (Success); 1**: Mobility of Fixture (Failed)

Table 6: Percent of frequency of both group

Cases	Number	Mean Std. Deviation	Z-Value	p-Value
Healthy	100	.0200	-1.94	0.052*
Osteoporotic	72	.0833		

*No significant difference ($p \leq 0.05$)**Table 7:** Comparison of Healthy versus Osteoporotic cases by Mann-Whitney Test

[10,11]. While Wong et al. suggest long-term oral bisphosphonate users can be treated with caution [12].

An official statement by the American Association of Oral and Maxillofacial Surgeons recommends patients to cease using bisphosphonate three months prior to and three months after oral surgery if possible, especially if a patient has been using bisphosphonate more than three years [13].

On the other hand, Jeffcoat published two prospective studies in 2006 which suggest that oral Bisphosphonate may not increase the incidence of osteonecrosis of the jaw. In the first study, 335 patients (173 women) were randomly assigned to 70 mg of alendronate weekly for 2 years, then alveolar bone height and safety were examined. No evidence of alveolar damage was seen, and there was a lower occurrence of infection in the Alendronate group. In the second single-blind study, implant success in 50 consecutive patients, 25 taking bisphosphonate and 25 age-matched control subjects, was blindly assessed for 3 years. No significant difference was seen in the 2 groups [14].

Javed F and Almas K, show in a search of 10 studies, the patients were using oral bisphosphonate, and in two studies, patients were using IV Bisphosphonate. Six case reports showed that the placement of implants in patients using Bisphosphonate could yield a successful osseointegration and function. Four retrospective studies demonstrated that bisphosphonate did not have a negative influence on implant success. Two studies showed a negative impact of bisphosphonate on implant success. The authors concluded from the results of this study that dental implants can osseointegrate and remain functionally stable in patients using bisphosphonate [15].

Carlos Madrid and Mariano Sanz, conclude from another analysis of one prospective and the three retrospective series (217 patients), the placement of an implant may be considered a safe procedure in patients taking oral bisphosphonate for 5 years with regard to the occurrence of bisphosphonate-related osteonecrosis of the jaw since in these studies no bisphosphonate osteonecrosis of the jaw has been reported. Moreover, the intake of oral-bisphosphonate did not influence short-term (1-4 years) implant survival [16].

In our study, Only six implants failed out of 72 fixtures, giving a success rate of 91.7%, which is comparable to the controlled healthy group success rate 94% [17], and in comparison with other study of osteoporotic patients on Bisphosphonate with 95% success who had 5 failed implants out of 100 implants [18]. No patient showed signs of bisphosphonate osteonecrosis of the jaw, concluding that patients who take oral bisphosphonate are no more at risk of implant failure than other patients.

Lopez-Cedrun [19], with 10 retrospective multicenter study analyzing all patients with bisphosphonate osteonecrosis of the jaw due to dental implants from 01/2009-06/2012. The authors state that the bisphosphonate osteonecrosis of the jaw was more common in the mandible.

Holzinger [20], stated that all patients with bisphosphonate osteonecrosis of the jaw from 04/2004-07/2012 were analyzed. Among those were 13 patients (47 implants) with implants as a trigger. 30 implants had to be removed. It takes longer for bisphosphonate osteonecrosis of the jaw development if implants are placed during or after bisphosphonate treatment compared to implants being inserted before bisphosphonate treatment.

Kwon [21], all nineteen patients with bisphosphonate osteonecrosis of the jaw due to dental implants from 06/2008-12/2011 were analyzed. Eight patients with bisphosphonate osteonecrosis of the jaw in the maxilla, 9 patients with bisphosphonate osteonecrosis of the jaw in the mandible, 2 patients with bisphosphonate osteonecrosis of the jaw in mandible and maxilla.

Al-Sabbagh [22], 203 patients with 515 implants; 20 out of those patients with osteoporosis and oral bisphosphonate. All patients with implant therapy from 08/2000 until 05/2004 were contacted and data was collected by interview (in person/per telephone) no bisphosphonate osteonecrosis of the jaw occurred

no implant was lost. Walter et al. [23], in their systematic literature review about dental implants in patients treated with antiresorptive medication conclude that successful implant therapy is feasible in patients receiving antiresorptive therapy. The risk of osteonecrosis development needs to be explained to the patient. In 2016 Sotirios et al. [24], conclude that the longer duration of the drugs' use and the intravenous administration could be considered as negative factors based on their current data. The placement of dental implants in posterior jaw regions could also be considered as negative factor, for the success of the implant treatment. The history of bisphosphonate use orally [25], cannot be considered as an absolute contraindication to implant placement therapy.

In March 2017 Dental Clinical guidance of Scotland perform that the risk of bisphosphonate osteonecrosis of the jaw following the placement of dental implants in patients being treated with antiresorptive is currently unknown. The risk of bisphosphonate osteonecrosis of the jaw in patients being treated with bisphosphonate drugs is thought to increase as the cumulative dose of the drug increases, as a consequence of the long half-life of this drug class.

Julie and her colleague [26], in their article describe the Association between oral bisphosphonate use and dental implant failure among middle-aged women stated that no significant interaction was observed ($p=0.41$), and they suggest that dental practitioners should be aware of the increased risk of implant failure associated with oral bisphosphonate use in the population.

American college of prosthodontists ACP [27] agreed on that patients who have received oral bisphosphonates for osteoporosis for less than 4 years and have no additional clinical risk factors may receive surgical procedures without delay or alteration of the procedure. In this group of patients, implant placement has not been shown to have an increased risk of bisphosphonate osteonecrosis of the jaw development; 8-10 however, it is recommended that the patient be given a specific informed consent that highlights the possibility of delayed implant failure coupled with the low risk of bisphosphonate osteonecrosis of the jaw development secondary to the continued use of oral bisphosphonates.

Osteoporosis is very common [28], particularly in postmenopausal women; it is characterized by decreases in bone mass and strength. Osteoporosis also affects the jawbone and is considered a potential contraindication in the placement of dental implants. However, studies in subjects with osteoporosis have shown no differences regarding implant survival when compared with healthy individuals. Therefore, osteoporosis cannot be considered a contraindication for implant placement if oral bisphosphonate are used.

Conclusion

Nowadays, dental implants have become more common treatment for replacing missing teeth and aim to improve quality of life for each patient by improving chewing efficiency, physical health, and esthetics. The clinical outcome of implant treatment is challenged in compromised (bone) conditions, as are frequently present in osteoporotic females. Most of menopause female are treated with bisphosphonate weather oral or intravenous route in severe cases or in tumor cases, patients on oral bisphosphonate are no more contraindicated for dental implantation if good assessment done for each case before decide to underwent surgery, concerning period and severity of disease, drug type, dose, period of use, route of administration.

All complication can face both surgeon and patient showed be entirely discussed in details with the patient and their families. Close follow up is mandatory for at least 4 years after dental implant placement, check clinically and radiographically for urgent intervention in case of occurrence of bisphosphonate osteonecrosis of the jaw in the site.

We recommend that implantology can be performed as a safe treatment modality in patients use oral bisphosphonate.

Physician has a great role hand to hand with the dentist to help such patients with bisphosphonate use in good health and away

from such serious complication as bisphosphonate osteonecrosis of the jaw.

Finally most importantly, make sure to keep up good oral hygiene practices if you're on bisphosphonate medication.

References

1. NIH Consensus Development Panel on Osteoporosis Prevention, Diagnosis, and Therapy. Osteoporosis prevention, diagnosis, and therapy. JAMA. 2001 Feb;285(6):785-795.
2. NIH. Fast Facts About Osteoporosis. NIH Osteoporosis and Related Bone Diseases. 2013.
3. Chesnut CH, Skag A, Christiansen C, Recker R, Stakkestad JA, et al. Effects of oral ibandronate administered daily or intermittently on fracture risk in postmenopausal osteoporosis. J Bone Miner Res. 2004 Aug;19(8):1241-1249.
4. Smeltzer S, Bare B, Hinkle J, Cheever K. Brunner and Suddarth's Textbook of Medical-Surgical Nursing. Lippincott Williams and Wilkins 11th edition. 2008, Philadelphia.
5. Manolagas SC, Jilka RL. Bone marrow, cytokines, and bone remodeling. Emerging insights into the pathophysiology of osteoporosis. N Engl J Med. 1995 Feb;332(5):305-311.
6. Ringe JD, Möller G. Differences in persistence, safety and efficacy of generic and original branded once weekly bisphosphonates in patients with postmenopausal osteoporosis. Rheumatol Int. 2009 Dec;30(2):213-221.
7. Epstein S. Update of current therapeutic options for the treatment of postmenopausal osteoporosis. Clin Ther. 2006 Feb;28(2):151-173.
8. Fromentin O, Lassauzay C, Nader SA, Jr. Albuquerque RF. Point of care. JCDA. 2008 Sep;74:7-8.
9. Winter A, Aaron S, Baradaran N, Sivitz J. A systematic review. Journal compilation c_ 2009, John Wiley and Sons, United States.
10. Bell BM, Bell RE. Oral bisphosphonates and dental implants: a retrospective study. J Oral Maxillofac Surg. 2008 May;66(5):1022-1024.
11. Hewitt C, Farah CS. Bisphosphonate-related osteonecrosis of the jaws: a comprehensive review. J Oral Pathol Med. 2007 Jul;36(6):319-328.
12. Wang HL, Weber D, McCauley LK. Effect of long-term oral bisphosphonates on implant wound healing: literature review and a case report. J Periodontol. 2007 Mar;78(3):584-594.
13. Advisory Task Force on Bisphosphonate-Related Osteonecrosis of the Jaws, American Association of Oral and Maxillofacial Surgeons. American Association of Oral and Maxillofacial Surgeons position paper on bisphosphonate-related osteonecrosis of the jaws. J Oral Maxillofac Surg. 2007 Mar;65(3):369-376.
14. Jeffcoat MK. Safety of oral bisphosphonates: controlled studies on alveolar bone. Int J Oral Maxillofac Implants. 2006 May-Jun;21(3):349-353.
15. Javed F, Almas K. Osseointegration of dental implants in patients undergoing bisphosphonate treatment: a literature review. J Periodontol. 2010 Apr;81(4):479-484.
16. Madrid C, Sanz M. What impact do systemically administered bisphosphonates have on oral implant therapy? A systematic review. Clin Oral Implants Res. 2009 Sep;20:87-95.
17. Al-Rawi RY, Alreda NA, Tawfeeq BA. Success and Failure of Implant in Bounded and Free End Saddle. Al-Rafidain Dent J. 2010;10(2):198-204.
18. Wynn RL. Prevalence rate of necrotic jaw bone in patients taking Fosamax®-type drugs continues to be low. Plus, more on dental implant success in Fosamax patients. Lexicomp, United States.
19. López-Cedrún JL, Sanromán JF, García A, Peñarrocha M, Feijoo JF, et al. Oral bisphosphonate-related osteonecrosis of the jaws in dental implant patients: a case series. Br J Oral Maxillofac Surg. 2013 Dec;51(8):874-879.

20. Holzinger D, Seemann R, Matoni N, Ewers R, Millesi W, et al. Effect of dental implants on bisphosphonate-related osteonecrosis of the jaws. *J Oral Maxillofac Surg*. 2014 Oct;72(10):e1-e8.
21. Kwon TG, Lee CO, Park JW, Choi SY, Rijal G, et al. Osteonecrosis associated with dental implants in patients undergoing bisphosphonate treatment. *Clin Oral Implants Res*. 2014 May;25(5):632-640.
22. Al-Sabbagh M, Robinson FG, Romanos G, Thomas MV. Osteoporosis and bisphosphonate-related osteonecrosis in a dental school implant patient population. *Implant Dent*. 2015 Jun;24(3):328-332.
23. Walter C, Al-Nawas B, Wolff T, Schiegnitz E, Grötz KA. Dental implants in patients treated with antiresorptive medication - a systematic literature review. *Int J Implant Dent*. 2016 Dec;2(1):9.
24. Sotirios NK, Savvas NK, Nikolaos N, Argirios LP, Nikolaos MK. The Impact of Bisphosphonate Therapy Upon Oral Implant Treatment; A Systematic Review. *Adv Dent & Oral Health*. 2016;3(2):555610.
25. NHS Education of Scotland. Oral Health Management of Patients Prescribed Bisphosphonates. Dental Clinical guidance. March 2017.
26. Yip JK, Borrell LN, Cho SC, Francisco H, Tarnow DP. Association between oral bisphosphonate use and dental implant failure among middle-aged women. *J Clin Periodontol*. 2012 Apr;39(4):408-414.
27. ACP members. Color and Shade Verification. American College of Prosthodontists, Chicago, United States.
28. Siebert T, Jurkovic R, Stelova D, Strecha J. Immediate Implant Placement in a Patient With Osteoporosis Undergoing Bisphosphonate Therapy: 1-Year Preliminary Prospective Study. *J Oral Implantol*. 2015 Jul;41:360-365.