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International Journal of Current Research
Vol. 9, Issue, 07, pp.55112-55115, July, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

CASE STUDY

EVALUATION OF PERI-IMPLANT SOFT AND HARD TISSUE WITH APPLICATION OF BISPHOSPHONATE ON IMPLANT SURFACE AND OSTEOTOMY SITE

***Shabnam Jahan, Mayur Kaushik, Amit Wadhawan and Dr. Nitin Tomar**

Department of Periodontology, Subharti Dental College, Meerut (UP)- 250005

ARTICLE INFO

Article History:
Received 17th April, 2017
Received in revised form
15th May, 2017
Accepted 11th June, 2017
Published online 31st July, 2017

Key words:

Dental Implant, Crestal bone loss,
Biologic Mediators, Antiresorptive Drug,
Bisphosphonates.

ABSTRACT

The requisites to long term success of dental implant are good quality bone and healthy gingiva. One of the long term risk with regard to dental implant is crestal bone loss around the implantresulting in peri-implantitis. Many techniques have been used to reduce the crestal bone loss around implants. One of the techniques used to prevent crestal bone loss includes the use of biological mediators. One group of such bone metabolism mediators is bisphosphonate. Bisphosphonates are antiresorptive drugs that act on osteoclasts and maintain bone density and strength by inhibiting osteoclast activity. In this present case report the local application of bisphosphonate was done to prevent crestalbone loss around the dental implant.

Citation: Shabnam Jahan, Mayur Kaushik, Amit Wadhawan and Dr. Nitin Tomar, 2017. "Evaluation of peri-implant soft and hard tissue with application of bisphosphonate on implant surface and osteotomy site", *International Journal of Current Research*, 9, (07), 55112-55115.

INTRODUCTION

There is archeological evidence that humans have attempted to replace missing teeth with implants for thousands of years. A dental implant is a biocompatible fixture to take the place of a natural tooth root, it is placed in jaw bone to support a dental prosthesis via a biological process called as osseo-integration (Misch, Carl, 2007). The requisites to long term success of dental implant are good quality bone and healthy gingiva. One of the long term risk with regard to dental implant is crestal bone lossaround the implantresulting in peri-implantitis. (Burbank dentist, 2014) The cause of this crestal bone loss is inflammation of surrounding soft tissue and bone. Albrektsson at al (Albrektsson *et al*., 1986), Albrektsson and Isidor (1994) and Rocs *et al*. (1997) defined a successful implant in terms of bone loss around an implant restoration, which after the accepted crestal bone loss of no more than 1.5 mm during the first year after placement should be no more than 0.2mm during subsequent year. Many techniques have been used to reduce the crestal bone loss around implants. One of the techniques used to prevent crestal bone loss includes the use of biological mediators. (Hauschka, 1990; Bonewald and Mundy, 1990) One group of such bone metabolism mediators is bisphosphonate. Bisphosphonates are antiresorptive drugs that act on osteoclasts and maintain bone density and strength by inhibiting osteoclast activity. (Sato *et al*., 1991) This case report describes the evaluation of crestal bone level around the implant soft and hard tissue with application of bisphosphonate on implant surface and osteotomy site clinically radiographically and by CBCT.

Corresponding author:* **Shabnam Jahan,
Department of Periodontology, Subharti Dental College, Meerut (UP)- 250005

Case presentation

A female patient aged 40 years presented to the department of Periodontology, Subharti Dental College & Hospital Meerut, with the chief complaint of missing tooth in left mandibular posterior teeth region. On examination mandibular left first molar was missing. Detailed medical and dental history was taken. Pre- operative photograph and Radiographic assessments were done with RVG (fig.1) & CBCT scan (fig.2) for three dimensional evaluation of bone. Also Periodontal assessment was done using clinical parameters. Diagnostic cast was made and Surgical template fabrication was done for implant placement. Written informed consent was taken from the patient. Under aseptic conditions, after assessing the pre-treatment records, local anesthesia was administered using I:200000 dilution of lignocaine. After identifying vital anatomical landmarks, the selected implant site was surgically exposed by giving crestal incision followed by crevicular incision and full thickness mucoperiosteal flap was raised (Fig.3). An initial lance drill was passed passed through surgical stent upto to the depth of 6mm (Fig.4) and then initial pilot drill was used diameter of implant were used to

expand the osteotomy. Then paralleling pin was used to verify that the desired angulation of implant was correct. Then modified bisphosphonate solution was prepared by dissolving sodium alendronate 20 mg in 1ml normal saline solution and implant (Alpha Bio – SPI) of suitable diameter was dipped into modified bisphosphonate solution (Fig.5) and same solution was used to irrigate osteotomy site as well (Fig.6). Then implant was placed (Fig.7) into the prepared site with a torque ratchet with insertion torque of 35 N cm. The procedure was completed by repositioning the mucoperiosteal flap and suturing was done using silk sutures. After assessing the healing period of 3 months, incision was placed over implant and soft tissue was reflected sufficiently to permit removal of cover screw. This allows visualization of the implant root component. A temporary healingabutment was attached to the implant and gingival tissue was sutrured around it. Healing abutment was left in situ for approximately 10 days after which healing abutment was removed and replaced by the final abutment on which subsequently the prosthetic crown was given (Fig.8). Oral hygiene instructions were given and patient was followed for 9 months. Then patient was recalled after 9 months. Photographs were taken and radiographic parameters were recorded by RVG and CBCT scan to evaluate crestal bone level around the implant.

RESULTS

After 9 months of follow up period clinical evaluation was done using plastic periodontal probe. Result shows there were no signs of inflammation, no bleeding on probing, pocket probing depth was less than 3mm and adequate width of keratinized gingiva was seen. Radiographic evaluation were done using RVG & CBCT and bone height was measured from alveolar crest to implant abutment junction. In RVG the bone height measured mesially and distally were 1.1 mm & 0.9 mm respectively (Fig.9). In CBCT bone height measured bucally and lingually were 1.2 mm & 1.0 mm respectively (Fig.10).

DISCUSSION

Bisphosphonates are compounds characterized by two C–P bonds. They are analogs of pyrophosphate. The chemical structure of bisphosphonate promotes binding to solid-phase calcium phosphates, such as bone mineral. As bone resorbing osteoclasts digest the bone, bisphosphonates bound to the bone will become internalized. The other side group on the bisphosphonate molecule regulates the potency to reduce bone resorption.

Fig.1. Pre operative RVG

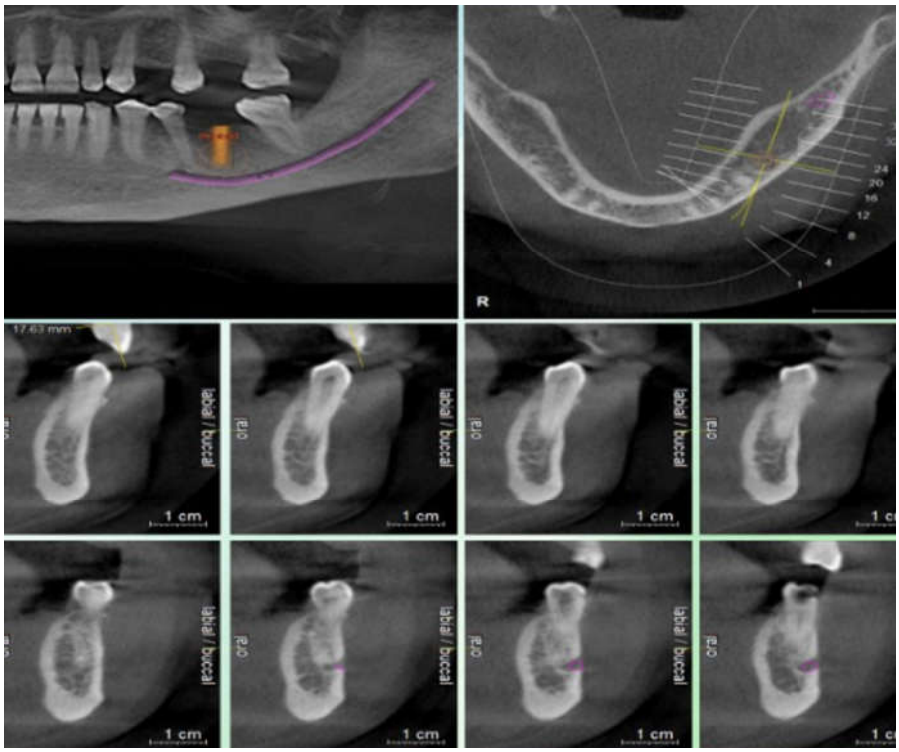

Fig.2. Pre operative CBCT

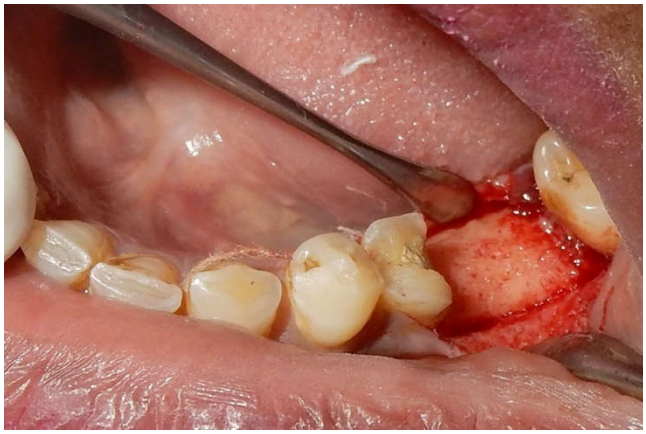

Fig.3. Edentulous ridge

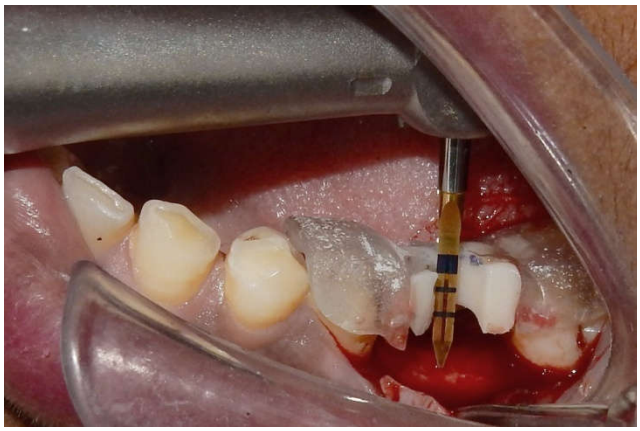

Fig.4. Lance drill

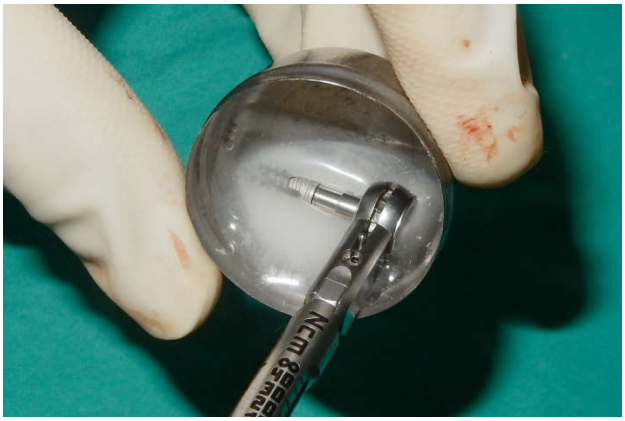

Fig.5. Implant coated with bisphosphonate

Fig.6. Osteotomy site irrigated

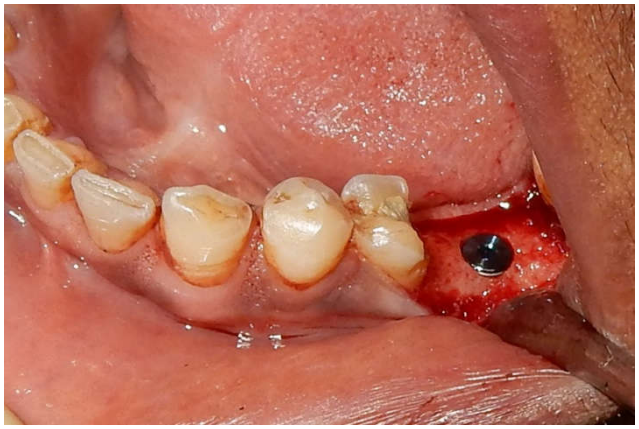

Fig.7. Implant placed

Fig.8. Crown placed

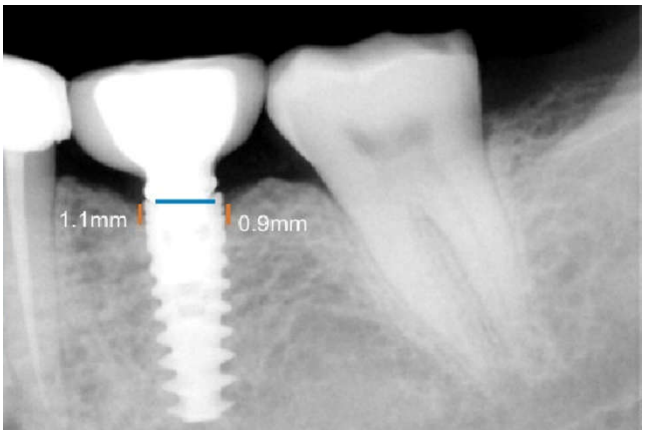

Fig.9. RVG measurements

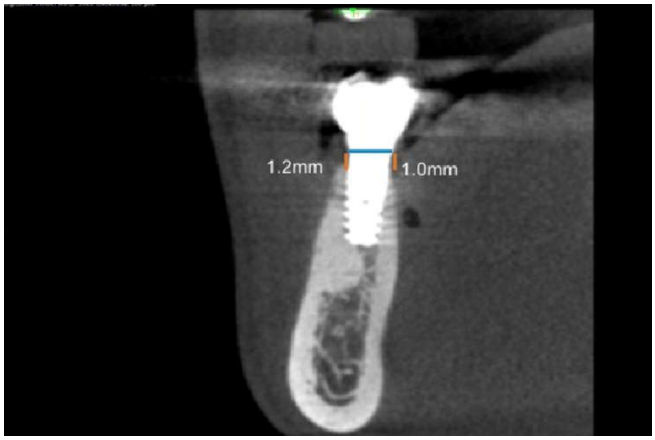

Fig.10. CBCT measurements

1st generation bisphosphonates are characterized by alkyl side chain. E.g. Etidronate. 2nd generation bisphosphonates are having an amino terminal group. E.g. Alendronate & Pamidronate. 3rd generation bisphosphonates characterized by cyclic side chains. E.g. Residronate. Systemic treatment with bisphosphonate is generally advised for prevention and treatment of primary & secondary osteoporosis, Pagets disease, multiple myeloma, bone metastasis etc. Alendronate has been also given intravenously to reduce alveolar bone loss in response to mucoperiosteal flap procedure. (Yaffe *et al*., 1995) to avoid the side effect of systemic use, local delivery methods have also been used. It has been shown that topical application of 20mg/ml of alendronate placed at the surgical mucoperiosteal site produced a striking reduction of bone loss. (Yaffe *et al*., 2000) Also local application of alendronate has been found to be useful in increasing the amount of peripheral peri-implant bone in bisphosphonate coated implants. In this present case report the implant surface and osteotomy site was treated with modified bisphosphonate solution and then crestal bone loss was evaluated by RVG and CBCT. Bone height was measured from alveolar crest to the implant abutment junction. The bone height measured by RVG on mesial and distal aspect of implant was 1.1mm & 0.9 mm respectively and by CBCT buccal and lingual bone height was measured as 1.2mm & 1.0 mm respectively. The results of the present study are in accordance with the previous studies (Albrektsson *et al*., 1986; Albrektsson and Isidor, 1994; Roos *et al*., 1997). In a previous study (Frencesco Zuffetti *et al*., 2009) the histomophometric response of bone tissue around an implant treated with a modified clodronate solution was evaluated. The result indicated that bisphosphonate treated implant had a quite high percentage of its surface covered by new bone, more than twice the amount of bone surrounding the control implant. Also (Stephen *et al*., 1999) local application of alendronate sodium on guided bone regeneration around dental implant was demonstrated. The result indicated a significant effect of locally applied alendronate with both types of implants on increased bone formation rate around dental implants. However, The adverse effects of bisphosphonate drugs have been extensively discussed and well documented in the literature. In a comprehensive review, BRONJ has been discussed as the major adverse effect of bisphosphonate drugs. (Abrahamsen, 2010) Osteonecrosis of the jaw develops only in those patients who are on bisphosphonate therapy, for more than 5 years for underlying bone disease, and undergoes oral surgical procedures. It was reported that Cumulative incidence of BRONJ in malignant disease in patients receiving I/V BISp is 0.8 and 12%. Oral BISp-0.7/100,000 person years of exposure (Ruggiero *et al*., 2009). So to avoid systemic side effects of this drug we have used local application of bisphosphonate. Abathi *et al*. (2010) did a study to evaluate the clinical stability of dental implants coated with bisphosphonate in a fibrinogen matrix. The level of the marginal bone around the each implant was measured by intraoral periapical radiograph and implant stability was recorded using resonance frequency measurements. In each patient, the bisphosphonate-coated implant showed the largest improvement in ISQ level of all implants. Histology showed no abnormalities.

Conclusion

Local application of sodium alendronate a modified bisphosphonate solution is useful in preventing the crestal bone loss around the dental implants. In the present case report, no side effects were reported as the patient was not suffering from any underlying bone disease and bisphosphonate was used only locally.

Competing interest

Dr. Shabnam Jahan, Dr. Mayur Kaushik, Dr. Amit Wadhawan, Dr. Nitin Tomar state that there are No Conflicts Of Interest.

Funding: NIL

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