

Evaluation Of Effect Of Dental Implant Thread Design On Marginal Bone Loss Using CBCT

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Abstract

Background: Dental implants have revolutionized dentistry for managing partially and fully edentulous patients. The present study was conducted to evaluate effect of dental implant thread design on marginal bone loss using CBCT.

Materials & Methods: 90 patients who received 125 dental implants of both genders were divided into 2 groups of 45 each. Group I patients received spiral implants and group II patients received dual fit implants. All patients were subjected to CBCT scan taken with Planmeca CBCT machine. Patients were recalled after 6 months and CBCT scans were repeated.

Results: Group I had 25 males and 20 females and group II had 22 males and 23 females. The mean marginal bone loss in group I was 2.01 mm and in group II was 2.23 mm. The difference was significant ($P < 0.05$). The mean survival rate in group I was 96.5% and in group II was 95.2%. The difference was significant ($P < 0.05$).

Conclusion: Spiral implants had higher survival rate and minimum less bone loss as compared to dual fit implants. The use of CBCT could aid in the accurate identification of bone loss around dental implants.

Key words: Dental implant, CBCT, Bone loss

INTRODUCTION

Dental implants have revolutionized dentistry for managing partially and fully edentulous patients. With this, success rates beyond 90% in long terms have been observed. Osseo integration is the key for success of implant.¹ Initial cortical is a general recommendation and is very critical for obtaining good Osseo integration and designing of implant plays an important role in providing a “well-seated” implant. There are four main components that help to achieve primary stability: Implant design, surface of implant, bone quality of the recipient site and the surgical procedure employed for placement of implant. Amongst these, implant design has been studied and associated often with shorter time for surgical procedure and even quick healing rate.²

Factors that have an impact on bone loss around implants can be divided into local, systemic, and social. The local factors include the implant body, occlusal loading, size of implant, and biological aspects.³ Structure-related factors of bone loss involve the type of connection between the implant and abutment (internal hex, external hex, conical, and their modifications), as well as the size of a microgap between the implant and abutment. Moreover, the type of an implant (one-piece, two-piece, and multi-part implant), its shape (tapered, non-tapered), diameter, length, stiffness and surface topography (created by mechanical machining, etching, oxidizing, sandblasting, laser patterning) or thread of the implant (e.g., V-thread, buttress, reverse buttress) play a key role in the process.⁴

Of the different implant thread design variables, pitch has the most significant influence on surface area. Thread leads influences the amounts of revolutions required to insert an implant in reverse proportion. As the thread lead grows, the thread helix angle grows accordingly, resulting in a potential effect on the forces transmitted to the bone. CBCT is the recent diagnostic modality used for the assessment of implant site.⁵ The present study was conducted to evaluate effect of dental implant thread design on marginal bone loss using CBCT.

MATERIALS & METHODS

This study was conducted among 90 patients who received 125 dental implants of both genders. All were informed regarding the study and their consent was obtained.

Data such as name, age, gender etc. was recorded. Patients were divided into 2 groups of 45 each. Group I patients received spiral implants and group II patients received dual fit implants. All patients were subjected to CBCT scan taken with Planmeca CBCT machine. The implants were covered by soft tissue, then covered with a healing cap or restored with a temporary restoration. Patients were recalled after 6 months and CBCT scans were repeated and survival rate of dental implants were assessed in both groups. Results were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of implants

Groups	Group I	Group II
Design	Spiral	Dual fit
M:F	25:20	22:23

Table I shows that group I had 25 males and 20 females and group II had 22 males and 23 females.

Table II Assessment of marginal bone loss

Groups	Mean	P value
Group I	2.01	0.05
Group II	2.23	

Table II, graph I shows that the mean marginal bone loss in group I was 2.01 mm and in group II was 2.23 mm. The difference was significant ($P < 0.05$).

Graph I Assessment of marginal bone loss

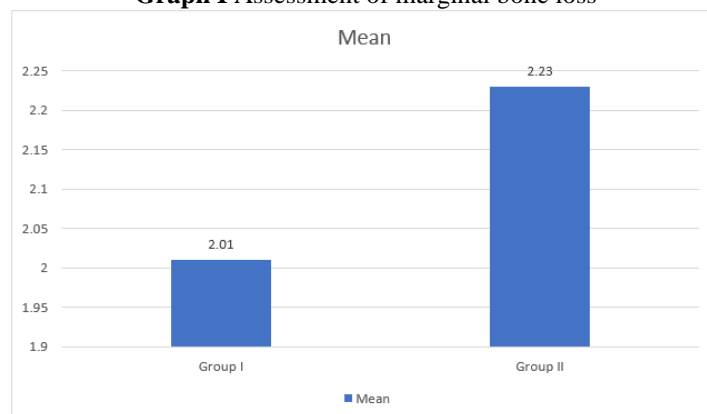


Table III Survival rates of dental implants in both groups

Groups	Percentage	P value
Group I	96.5%	0.02
Group II	95.2%	

Table III shows that mean survival rate in group I was 96.5% and in group II was 95.2%. The difference was significant ($P < 0.05$).

DISCUSSION

Poor primary stability of implant results in implant failure; other related causes include inflammation, bone loss, biomechanical overloading and osteonecrosis.⁶ Primary stability influences the secondary stability and gradually the overall stability of the implant. Thread design includes thread shapes. Various thread shapes are designed for effective force insertion and transmission. Thread shape is determined by the thickness and thread face angle.⁷ Various shapes available include; V-shape, square shape, buttress and reverse buttress shape. Studies using finite element analysis have shown how thread profile may affect stress concentration and distribution.⁸ Out of the different thread designs V-shape and broader square shape generated less stress compared with the thin and narrower square thread in cancellous bone.⁹ The present study was conducted to evaluate effect of dental implant thread design on marginal bone loss using CBCT.

We found that group I had 25 males and 20 females and group II had 22 males and 23 females. Dwingadi et al¹⁰ assessed outcomes of dental implant treatment based on the evaluation of bone conditions using Cone Beam Computed Tomography (CBCT). The average of mesial bone loss was 1.08 mm and 1.36 mm on distal bone. Every dental implant had lingual/palatal bone on level 1 to 3, only 1 (6.5%) didn't have bone on level 4, 3 implants (9.7%) had no bone at level 5 and 6, and 22 implants (74.2%) had no bone at level 7/implant platform. There were 8 implants (25.8%) didn't have buccal bone at level 7, only 1 implant (3.2%) didn't have buccal bone at level 2,4,5 and 6, and there were 2 implants (6.5%) had no buccal bone on level 3. Dehiscence / fenestration can be seen on 90% of the implant subjects.

We found that the mean marginal bone loss in group I was 2.01 mm and in group II was 2.23 mm. Omianer et al¹¹ assessed the implant macrostructure effect on marginal bone loss using 3 dental implant thread designs with differences in thread pitch, lead, and helix angle. In total, 1361 implants met the inclusion criteria representing the 3 types of implants macrostructure. Overall survival rate was 96.3% with 50 implants failing (3.7%) out of a total of 1361 implants. Survival rates for the 3 groups were: group A 96.6%, group B 95.9%, and in group C 100%. Average bone loss for groups A, B, and C were 2.02 mm, 2.10 mm, and 1.90 (61.40) mm, respectively. Pairwise comparisons revealed that less bone loss occurred in group A compared with group B.

We found that the mean survival rate in group I was 96.5% and in group II was 95.2%. Orsini et al¹² determined the osseointegration process in animal cancellous bone. Two types of implants with the same surface treatment were tested: one with a narrow pitch and one with a wide pitch, demonstrating that implants with a narrow pitch had improved anchorage due to greater surface area and bone-to-implant contact (BIC). Studied also suggested a conical connection to be one of the best. Its main advantage is the load transfer along two conical constructions that causes limited abutment loading.¹³ This design provides separation of the interior of an implant from the surrounding tissues, limiting microleakage. The most frequently used type of a conical connection is Morse taper, which ensures integrity between the implant and abutment, with the smallest micromovements observed at a narrow (2°–4°) inclination angle of conical prosthetic abutment.¹⁴

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that spiral implants had higher survival rate and minimum less bone loss as compared to dual fit implants. The use of CBCT could aid in the accurate identification of bone loss around dental implants.

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