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Original Research

Assessment of effect of dental implant thread design on marginal bone loss

Rahul Das

Associate Professor, Department of Dentistry (Prosthodontics), Lord Buddha Koshi Medical College and Hospital, Saharsa, Bihar, India

ABSTRACT:

Background: One of the most promising methods now being utilized to repair missing teeth is dental implants. The present study was conducted to assess effect of dental implant thread design on marginal bone loss. **Materials & Methods:** 80 patients of both genders who received 124 dental implants were studied. Patients were divided into 2 groups of 40 each. Group I patients received spiral implants and group II patients received dual fit implants. The mean bone loss and survival rate was compared in both groups. **Results:** Group I had 18 males with 28 implants and 22 females with 34 implants and group II had 24 males with 38 implant and 16 females with 24 dental implants. The mean marginal bone loss in group I was 2.02 mm and in group II was 2.28 mm. The difference was significant (P< 0.05). The mean survival rate in group I was 95.4% and in group II was 94.1%. **Conclusion:** In comparison to dual fit implants, spiral implants had a greater survival rate and less bone loss.

Key words: Bone loss, Dental implant, Spiral implant

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Corresponding author: Rahul Das, Associate Professor, Department of Dentistry (Prosthodontics), Lord Buddha Koshi Medical College and Hospital, Saharsa, Bihar, India

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INTRODUCTION

One of the most promising methods now being utilized to repair missing teeth is dental implants. They have transformed oral rehabilitation for treating individuals who are partially or completely edentulous, reaching long-term success rates above 90%.[1] The success of the implant is dependent on osseo integration. A "well-seated" implant is made possible by the design of the implant, which is a common suggestion and essential for achieving effective osseo- integration. Implant failure is caused by a lack of primary stability; related conditions include osteonecrosis, inflammation, bone loss, and biomechanical stress.[2]

2Secondary stability and eventually the implant's total stability are influenced by primary stability. Primary stability is primarily achieved by four factors: implant design, implant surface, recipient site bone quality, and the surgical technique used to put the implant. Among these, implant design has been researched and frequently linked to a quicker surgical process and even a quicker recovery rate.[3]

Pitch has the biggest impact on surface area of all the implant thread design factors. An in vivo animal study showing improved anchoring of implants with a narrow pitch has brought attention to the significance of the thread pitch.[4] The number of revolutions necessary to introduce an implant is inversely correlated to thread lead. The forces imparted to the bone could be impacted as the thread lead and thread helix angle both grow over time.[5] The present study was conducted to assess effect of dental implant thread design on marginal bone loss.

MATERIALS & METHODS

This study was conducted on 80 patients of both genders who received 124 dental implants. All were informed regarding the study and their written consent was obtained. Ethical clearance was obtained before starting the study.

Data such as name, age, gender etc. was recorded. Patients were divided into 2 groups of 40 each. Group I patients received spiral implants and group II patients received dual fit implants. Following manufacturer's protocol, dental implants were

inserted. Theimplants were covered by soft tissue, then covered with a healing cap orrestored with a temporary restoration. Parameters such as plaque, gingival recession, and probing depthindices were recorded after 6 months. The mean bone loss and survival rate was compared in both groups. Results were tabulated and subjected to statistics. P value <0.05 was considered significant.

RESULTS

Table I Distribution of implants

Groups	Group I	Group II
Design	Spiral	Dual fit
M:F	18:22	24:16
Dental implant	28:34	38:24

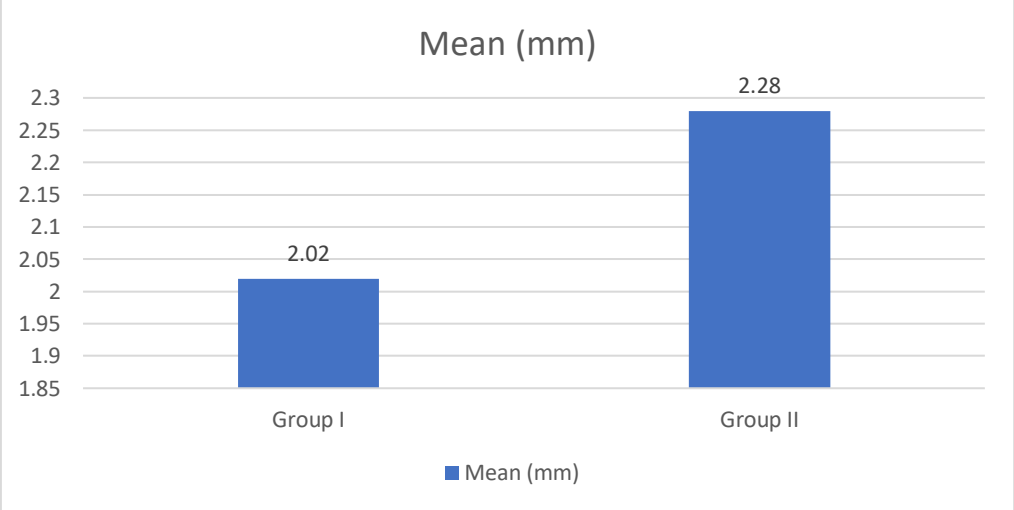
Table I shows that group I had 18 males with 28 implants and 22 females with 34 implants and group II had 24 males with 38 implant and 16 females with 24 dental implants.

Table II Marginal bone loss in both groups

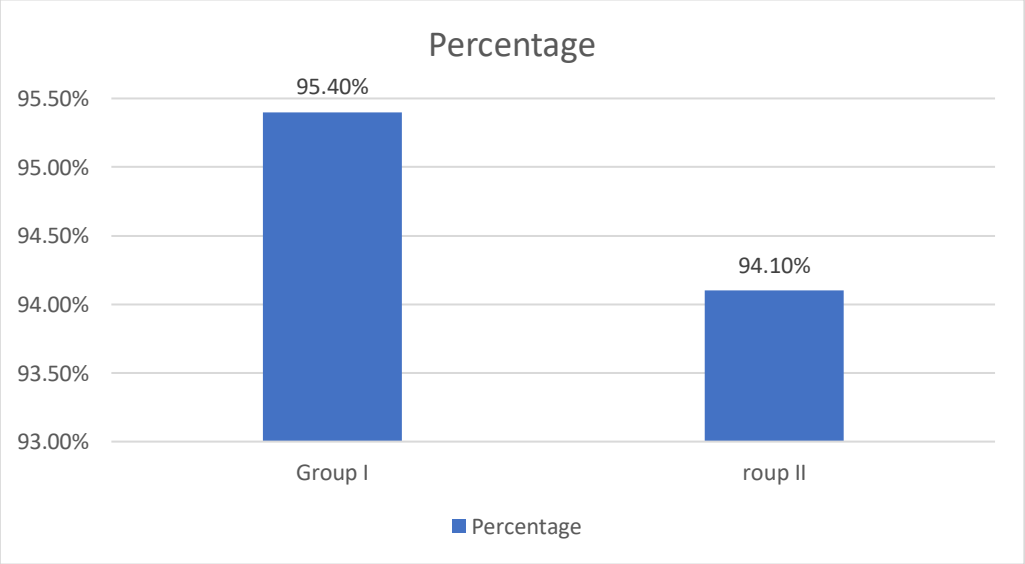
Groups	Mean (mm)	P value
Group I	2.02	0.03
Group II	2.28	

Table II, graph I shows that the mean marginal bone loss in group I was 2.02 mm and in group II was 2.28 mm. The difference was significant (P< 0.05).

Graph I Marginal bone loss in both groups



Graph II Assessment of dental implants survival rates



Graph II shows that mean survival rate in group I was 95.4% and in group II was 94.1%.

DISCUSSION

The goal of modern implant dentistry is to not only achieve implant survival but also to ensure an esthetic and functional restoration that is compatible with the existing dentition.[6] This is particularly relevant for the anterior maxilla, where the teeth and surrounding structures are clearly visible and, therefore, have a direct impact on the patient's quality of life. Single-tooth implant placements in the esthetic zone have become a reliable treatment option, with high implant survival rates. Thread shapes are a part of thread design. To effectively inject and transmit force, several thread shapes are devised. Thickness and thread face angle both affect thread form. There are many different shapes available, including V-shapes, squares, buttresses, and reverse buttresses.[7] Finite element analysis studies have demonstrated how thread profile may impact stress distribution and concentration. In comparison to the thin and narrower square thread in cancellous bone, the V-shaped and larger square threads produced less stress.[8]Thread pitch refers to the distance from the centre of the thread to the centre of the next thread, measured parallel to axis of screw and can be calculated by diving unit lengths with by number of threads. It has an inverse relation with the number of threads per unit area. It is different from Lead which is distance from centre of thread to the centre of same thread after one turn or more accurately the distance that screw would advance in axial direction if turned one complete revolution. Now for single-threaded implants lead is equal to pitch but as threads increase to double or triple, the lead increases by one.[9] The present study was conducted to assess dental implant thread design on marginal bone loss.

We found that group I had 18 males with 28 implants and 22 females with 34 implants and group II had 24 males with 38 implant and 16 females with 24 dental implants.Arnhart et al[10] in their study 177 patients (325 implants) were included and randomly allocated into one of three treatment groups: NAI (variable-thread design, NobelActive internal connection), NAE (variable-thread design, NobelActive external connection) and, as control, NR (standard tapered design, NobelReplace tapered groovy). 127 patients (NAI: 45, NAE: 41, NR: 41) were followed-up and evaluated after 36 months. No significant differences in cumulative survival rates were seen for the groups (NAI: 95.7%; NAE: 96.3%; NR: 96.6%). In all groups, bone remodelling occurred during the first 3 months, with stable or even increasing bone levels after the initial remodelling period. The bone remodelling from insertion to 36 months for the NAI group (-0.89 ± 1.65 mm) was comparable (P = 0.98) to that of the NR group (-0.85 ± 1.32 mm). The NAE group showed comparable bone remodelling during the first year, with an increase in following years resulting in significantly less overall bone loss (-0.16 ± 1.06 mm) (P = 0.041). Overall improvement in papilla size was observed in all treatment groups.

We found that the mean marginal bone loss in group I was 2.02 mm and in group II was 2.28 mm. Orsini et al[11] investigated 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).

We observed that the mean survival rate in group I was 95.4% and in group II was 94.1%. Omianer et al[12] evaluated 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 mm, respectively. Pairwise comparisons showed that less bone loss occurred in group A compared with group B.

Baer et al[13] in their study all implants were placed in healed sites and immediately provisionalized. MBLs, soft-tissue parameters, and oral-health impact profile (OHIP) were evaluated at implant insertion, 6, 12, 24, 36, and 60 months. Seventy-seven patients (81 implants) completed the 5-year follow-up. The 5-year cumulative survival and success rates were 97.8%, and the mean MBL change from implant insertion to 5 years was -0.80 ± 1.13 mm. Optimal papilla index scores were observed at 90.1% of sites at 5 years compared with 32.8% of sites at insertion. Pink esthetic score, modified bleeding and plaque indices, and OHIP showed statistically significant improvement at the 5-year follow-up.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that in comparison to dual fit implants, spiral implants had a greater survival rate and less bone loss.

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