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Intricate Assessment of Effects of 'With and Without' Platform Switched Implants on Primary Stability of Cement Retained Implants: An Original Research Study

Dr. Ch. Kavitha[1], Dr. K. Sravanthi[2], Dr. G. Priyanka[3], Dr. Jahanara[4], Dr. Alaveni Manga N[5], Dr. P Gnana Harshitha[6]

[1]MDS, Assistant Professor, Department of Prosthodontics and Crown & Bridge and Implantology, Mamata Dental College and Hospital, Khammam, Telangana, India
[2]MDS, Prosthodontist, Hyderabad, India
[3]MDS, Assistant Professor, Department of Prosthodontics and Crown & Bridge and Implantology, Mamata Dental College and Hospital, Khammam, Telangana, India
[4]MDS, Prosthodontist, Vikarabad, India
[5]MDS, Assistant Professor, Department of Prosthodontics and Crown & Bridge and Implantology, Meghna Dental College, Nizamabad, Telangana, India
[6]MDS, Assistant Professor, Department of Prosthodontics and Crown & Bridge and Implantology, Nimra Institute of Dental Sciences, Ibrahimpatnam, Vijayawada, Andhra Pradesh, India

Corresponding Author: Dr. Ch. Kavitha, MDS, Assistant Professor, Department of Prosthodontics and Crown & Bridge and Implantology, Mamata Dental College and Hospital, Khammam, Telangana, India, Email: kavithachbds@gmail.com

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Abstract

Background and Aim: Deficient bone quantity is one of the greatest challenges in practicing and managing implant based therapies. Several clinical experiments/implant design modifications have been tried by leading researchers to overcome this dilemma. Implant platform switching is one such criterion which is recently used to enhance the implant stability. Therefore this in-vivo study was executed to assess the effects of 'with and without' platform switched implants on primary stability of cement retained implants.

Materials and Methods: Total 22 patients were selected by simple random technique including both male and female patients. A single identical operatory team was engaged for all implant osteotomies. Strict sterilization and disinfection was maintained as per standards. All 22 patients were studies under two groups. Group 1 patients included 11 patients wherein Platform Switching concept was used while Group 2 patients included 11 patients wherein Platform Switching concept was not used. Implant primary stability was tested by electrical device Periotest M. The estimation was attempted for each individual implants after osteotomy procedure. Primary stabilities were noted in post-operative phases for both the groups and results outlined. The responses were classified as satisfactory and non-satisfactory in post-operative phases.

Statistical Analysis and Results: Statistical analysis was completed with SPSS software. P-value was highly significant for age group 24-28 years (0.01). In Group 1, total 9 patients showed satisfactory responses regarding primary stability with highly significant p value (0.01). Here, 2 implants showed non-Satisfactory responses about implant primary stability with non-significant p value. In Group 2, total 7 patients showed satisfactory responses about primary stability with significant p value (0.03). One-way ANOVA test also confirmed highly significant values (0.001).

Conclusion: Within the limitations of the study, authors concluded Implants with platform switching concept shows satisfactory results relating to primary stability of cement retained implants (as compared with implants without switching concept). However, it is strongly advocated to refer and consider other crucial aspects also like host responses, soft tissue health and status of microbial load in oral environment.

Keywords: Dental Implant, Platform Switching, Bone, Primary Stability, Osteotomy, Alveolar Bone

Introduction

Crestal bone loss or peri-implant bone loss is very common around implants. This marginal bone loss shows varying pattern with increasing time. Implant crestal bone loss is directly related to the bacterial colonization near implant.[1,2] Albrektsson and associates were the initial workers who measured the quantity of bone loss after implant placement in the bone.[3] They also stated that crestal bone conservation must be planned even before the treatment planning for implant therapy. The concept of platform switching refers to the fitting of a smaller diameter abutment on a larger diameter implant collar.[4-5] This linking moves the perimeter of the implant abutment junction inner-ward near to the central axis of the implant. Many of the researches have been done afterwards to exactly explore the mechanism of action of implant platform switching philosophy.[6,7,8] Researchers believe that implant platform switching shifts inflammatory cell infiltrate inward and far from the neighboring crestal bone.[9,10] Implant platform switching also sustain the biological width and increase the space of implant abutment junction from the crestal bone level.[11,12,13] Therefore, primary stability of dental implants is solely offered by underlying bony support architecture.[14,15] However, none of the methods is appears to be perfect. In view of all these notable facts and documentary evidences, this in-vivo study was executed to assess the effects of 'with and without' platform switched implants on primary stability of cement retained implants

Materials and Methods

This study was abstracted and conducted in an attempt to see the possible solution of implant primary stability as related to its design modification (Platform Switching Concept). Since it was an in-vivo study, patients were selected from the regular outpatient department on the institute. Patients those requiring replacement of lower posterior missing teeth were entertained. Only single partially edentulous area (missing first mandibular molar region) of either side was chosen for study. Simple random technique was employed for sample selection procedure. Randomization was also ensured to avoid any possible bias which could alter the results. Both male and female patients were selected for the study. After explaining the study, 22 patients got ready for participation in the study. Authors also explained them in detail about possible risk, benefit and privacy policy. To ensure the uniformity, authors arranged single identical operatory team for all implant based osteotomy interventions. Only cement retained implants were studied as per the set objectives. All implants those rehabilitated with screw philosophy were not included in the study. Strict sterilization and disinfection was maintained throughout the operatory during the osteotomy procedure. Inclusion criteria included; patients with satisfactory bone availability for retaining implant, patients in the age range of 24-48 years, cooperative patients, patients without smoking habit. Exclusion criteria included patients with unacceptable existing occlusion, patients with any type of post operative follow up problem, patients taking heavy drugs for other problem which could probably hamper the data quality, patients with diabetes or high blood pressure issues. Informed and signed consents were obtained from all the participating patients mandatorily. All 22 patients were studies under two groupings. Group 1 patients included 11 patients wherein Platform Switching concept was used during implant placement and rehabilitation procedures. Group 2 patients included 11 patients wherein Platform Switching concept was not employed during implant placement and rehabilitation procedures. Implant primary stability was evaluated via electronically automated device Periotest M

(Stomshop Inc., Germany). The evaluation was completed for each individual implants after osteotomy procedure. Evaluation of implant primary stability was attempted by two individual experts by clinical check and symptomatic assessment of positioned fixtures. Clinical primary stabilities and related performances were noted in post operative phases for both the groups and results framed accordingly. The responses were categorized as satisfactory and non-satisfactory in post-operative phases. Statistical analysis was conducted to draw the inferences and results. P value less than 0.05 was taken as significant.

Statistical Analysis and Results

All the gathered data was entered into mater excel sheet for further analysis. Initially, data was checked for any possible incorporated error. Afterwards data was subjected to basic statistical analysis with SPSS statistical package for the Social Sciences version 22 for Windows. Nonparametric test, specifically chi-square test, was used for supplementary data analysis; p-value. Out of 22 studied patients, 16 were males and 6 were females [Table 1, Graph 1]. P-value was highly significant for age group 24-28 years. It was 0.01. Maximum 8 patients were noticed in age group of 29-33 years. Table 2 reveals about the fundamental statistical explanations with level of significance evaluation using "Pearson Chi-Square" test **(**Group 1: for effects of platform switched implants on primary stability of cement retained fixtures, n=11), acknowledged as satisfactory and non-satisfactory in post-operative phases. Here, total 9 patients showed satisfactory responses regarding primary stability. The measured statistical mean was 1.67 and standard deviation was 0.569. Accordingly the standard error was 0.735 and Pearson Chi-Square Value was 1.471. The measured p value was highly significant. It was 0.01. In Group 1, total 2 implants showed Non-Satisfactory responses about implant primary stability. The measured p value was not significant. It was 0.20. Table 3 demonstrates about the fundamental statistical explanations with level of significance evaluation using "Pearson Chi-Square" test **(**Group 2: for effects of non-platform switched implants on primary stability of cement retained fixtures, n=11), acknowledged as satisfactory and non-satisfactory in post-operative phases. Here, total 7 patients showed satisfactory responses about primary stability. The calculated statistical mean was 1.24 and standard deviation was 0.837. Consequently the standard error was 0.535 and Pearson Chi-Square Value was 1.859. The measured p value was significant. It was 0.03. In Group 2, total 4 implants exhibited Non-Satisfactory responses about implant primary stability. The measured p value was not significant. It was 0.60. Table 4 illustrates about the estimation among all studied patients using one-way ANOVA [Group 1= platform switched implants, Group 2= non-platform switched implants]. The measured level of significant was highly significant. It was interestingly 0.001.

Table 1: Age & gender based statistical explanation of participating patients

Age Group (Years)	Male	Female	Total	P value
24-28	4	1	5	0.01*****
29-33	6	2	8	0.20
34-38	3	1	4	0.10
39-43	2	1	3	0.50
44-48	1	1	2	0.8 0

Total	16	6	22	*Significant
***p<0.05 Significant**				

Graph 1: Patients demographic assortments and associated details

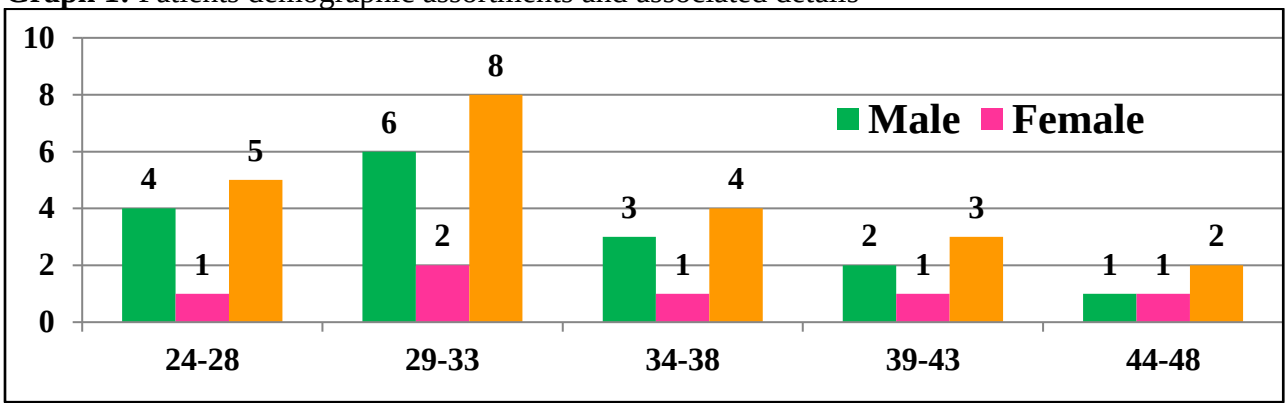

Table 2: Fundamental statistical explanations with level of significance evaluation using "Pearson Chi-Square" test (Group 1: for effects of platform switched implants on primary stability of cement retained fixtures, n=11), acknowledged as satisfactory and non-satisfactory in post-operative phases

Status	n	Stat. Mean	Std. Dev.	Std. Error	95% CI	Pearson Chi-Square Value	df	p value
Satisfactory	9	1.67	0.569	0.735	1.04	1.471	1.0	0.01*
Non-Satisfactory	2	1.04	0.901	0.748	1.25	1.902	2.0	0.20
***p<0.05 significant**								

Table 3: Fundamental statistical explanations with level of significance evaluation using "Pearson Chi-Square" test (Group 2: for effects of non-platform switched implants on primary stability of cement retained fixtures, n=11), acknowledged as satisfactory and non-satisfactory in post-operative phases

Status	n	Stat. Mean	Std. Dev.	Std. Error	95% CI	Pearson Chi-Square Value	df	p value
Satisfactory	7	1.24	0.837	0.535	1.54	1.859	1.0	0.03*
Non-Satisfactory	4	1.12	0.305	0.238	1.04	1.527	2.0	0.60
***p<0.05 significant**								

Table 4: Estimation amongst all studied patients using one-way ANOVA [Group 1= platform switched implants, Group 2= non-platform switched implants]

Variables	Degree of	Sum of Squares ∑	Mean Sum of	F	Level of

	Freedom		**Squares m∑**		**Sig. (p)**
Between Groups	4	1.420	1.049	1.4	0.001*****
Within Groups	13	2.748	0.263	-	
Cumulative	107.23	06.944	***p<0.05 significant**		

Discussion

Literature has well evidenced about the behavior of alveolar bone after dental implant placement and loading.[16,17] Researchers had studied about the mean bone loss as noticed in platform switched implants and non-implant switched implants. They found very interesting data which revealed the importance of platform switching concept.[18,19,20] It was shown that crestal bone loss was 0.22 mm in platform switching cases while it was 2.02 mm in non-platform switching cases. Similarly, platform switched cases confirmed very negligible vertical/angular bone loss. Few pioneer workers stated about the utilization of Morse taper connection in implants.[21,22,23] Actually the Morse taper connection is highly indicative for the rehabilitation of partially and completely edentulous arches. Now days implant manufacturers have started including principle of platform switching in their implant design itself by use one size diameter abutment, a 90° step external implant–abutment connection and a Morse taper internal connection.[24,25] Canay and Akça studied in detail about the biomechanical aspects of bone-level diameter shifting at implant-abutment interface. They also recommended the clinical applications and utilization of platform switching concept in vulnerable situations.[26] Gupta and other workers studied about the platform switching technique and crestal bone loss around the dental implants in their review. They stated that the platform switching concept preserve crestal bone nearby the implants and platform switching concept must be followed when clinical conditions in implant placement favourable.[27] Prosper and others also conducted a randomized prospective multicenter trial to evaluate the platform-switching technique for the prevention of post-restorative crestal bone loss. Their results were in agreement with our results and outcomes.[28] Therefore clinician must be comprehensively aware about the etiology of crestal bone loss and their mode of progression. Nevertheless, crestal bone preservation is the imperative key to success in oral implantology. In most of the conditions, platform switching concepts maintain optimal biological width. Some researchers have confirmed that platform switch concept maintain acceptable esthetics by preserving inter dental papilla in anterior cases.[29-33]

Conclusion

Within the limitations of the study, authors concluded remarkably striking inferences and outcomes. Implants fixtures with platform switching concept exhibited satisfactory results pertaining to primary stability of cement retained implants. Instead, implants fixtures without platform switching concept showed only moderately satisfactory results about primary stability of cement retained implants. Hence authors suggested recognized usage of implants fixtures with platform switching concept for handling vulnerable implant conditions. Still, clinicians must not utilize platform switching concept blindly for all scenarios. Additionally, both of the tested methodologies are having their own indications and contraindications also. It is therefore advocated to refer and consider other critical factors also like host responses, soft tissue

conditionings, status of microbial load in oral milieu. Authors also expect some other long term future studies so as to establish other concrete guidelines in these perspectives.

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