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Comparative evaluation of effectiveness of progressive occlusal equilibration using conventional and computerized analysis on crestal bone loss around single implant in posterior region.

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Abstract: ***Background: Dental implantology has emerged as treatment of choice for missing tooth replacement. Implant occlusion is a dominant factor which affects implant success. Various practices are there for occlusal consideration and its adjustment like articulating paper and T scan for regularly employed in clinics. Very less literature is available on effectiveness of better method for occlusal correction. Objectives: To assess and analyze efficacy of occlusal equilibration using computerized analysis at various time intervals to evaluate the crestal bone loss around single posterior implants. Methods: This study will be performed on 50 partially edentulous patients with single posterior missing tooth will be selected. Implant with two-stage protocol will be placed. Primary stability at first stage surgery and secondary stability at second stage surgery will be evaluated. Immediately after loading of implant CBCT will be taken to evaluate base line crestal bone level, with cement retained PFM crown. In study group T scan is used as intervention. CBCT will be taken after 12 months of placement of implant prosthesis to evaluate crestal bone level for all patients. Results: Statistical significance of the mean differences between the measurements in the interval of 12 months will be tested with Student's paired t-test, Chi square test, and unpaired t test. Conclusion: Periodic equilibration using T scan will be an effective protocol to control the further crestal bone loss. There by this procedure will also be addressing the complication in occlusal consideration in implantology, eventually result in implant success.***

Keywords: ***Crestal bone loss, Cone beam Computed Tomography, T-scan, Implantology, equilibration***

RATIONALE

Dental implant is one of the most proven successful treatments option,[1,2,3,4] but due to absence of periodontal ligament, implant can be overloaded due occlusal forces.[5] T-scan computerized analysis and conventional articulating paper are method to determine occlusal forces.[5] Purposefully this study is performed to assess and analyze effectiveness of progressive

occlusal equilibration using conventional and computerized analysis for loss of crestal bone around a implant in posterior area of jaw.

INTRODUCTION:

Dental implants are one of the most effective & successful treatments for missing teeth replacement. Crestal bone around implant plays an important role in determining the criteria for the success of the osseointegrated dental implant.[4] A Dental implant is supposed to bear more occlusal forces than natural teeth due to absence of periodontal ligament. So there is no shock absorbing mechanism in implants and thus due to this condition, the implant occlusion must be improved to reduce the forces acting over the implants.[5] Implant-protected occlusion is one of the proposed concept for implants, it stated that contact of occlusion should be recorded for patients in heavy and light bite with anatomical crown & implant crown opposing each other. In light bite occlusal contact must not be there and in heavy bite occlusal contact must be light, but stability of established contact is not uniform thus resulting in detrimental forces.[5,6] Dario L J[7] in his research concluded, after 18 months of prosthesis placement, 50% patients has change in occlusion and in first 6 months higher number of patients has occlusal changes. Articulating papers are not found to have correlation between size of paper mark and force generated.[8] T-Scan is more accurate method for evaluating occlusal forces of relative percentage and contact in real time.[5] So purpose intended with this study is to evaluate bone loss of crestal area around a implant in posterior area of jaw by using T-scan having follow up period of 3, 6 and 12 months

AIM:

Comparative evaluation of effectiveness of progressive occlusal equilibration using conventional and computerized analysis on crestal bone loss around single implant in posterior region**.**

OBJECTIVES:

1. To evaluate crestal bone in control and experimental group immediately after loading of implant

2. To evaluate and perform occlusal equilibration using conventional method in control group and by using Computerized analysis in experimental group at 3,6 and 12 months

3. To evaluate loss of crestal bone in control and experimental group after a year of implant loading

4. To analyze and compare loss of crestal bone in control and experimental group

METHODOLOGY:

Randomized control clinical trial [10] will be conducted to evaluate of crestal bone loss of implant protected occlusion using a T-Scan Novus of single ossteointegrated implant in posterior region of jaw will be carried out in the Department of prosthodontics, Sharad Pawar dental college and hospital, Datta Meghe Institute of Medical Sciences, Deemed to be University. A total number of 50 partially edentulous patients with missing single posterior mandibular tooth will be selected from the Out Patient Department (OPD) of the Department of Prostho-

dontics, Sharad Pawar Dental College, Sawangi, Wardha. All patients will be provided written informed consent before their participation in the study.

STUDY DESIGN: Randomized control clinical trail

DURATION: 2 years

SAMPLE SIZE: 50 Patients (ANNEXURE II)

INCLUSION CRITERIA:

1. Osseointegrated single posterior dental implant
2. Presence of natural teeth in opposing and adjacent region
3. Absence of any systemic diseases

EXCLUSION CRITERIA:

1. Patients not willing to participate and follow up for the prescribed duration of the study
2. More than single missing posterior tooth in the mandibular posterior region
3. History of bruxism and smoking

MATERIAL REQUIRED

1. Physiodispensor
2. CBCT machine
3. Dental implant and Abutment
4. Implant surgical kit
5. Addition silicone
6. Zinc phosphate luting cement
7. Irreversible hydrocolloid Neocolloid
8. Gingival former, implant analog, transfer coping)

I. PATIENT SELECTION

This study will be performed for the Duration of 2 years on 50 partially edentulous patients reporting to the Department of Prosthodontics, SPDC, Wardha, for tooth replacement with implant. Patient will be allowed into 2 groups randomly. One is controlled group; other is study group, having 25 patients in each group. Information will be provided to patients regarding study and written consent will be obtained. Patient with single

posterior missing tooth will be selected. Stent is prepared.[11] Implant with two-stage protocol will be placed.[12]Primary stability first stage surgery and secondary stability at second stage surgery will be evaluated [13]Immediately after loading of implant CBCT will be taken to evaluate base line crestal bone level, with cement retained PFM crown. Occlusal contact will be equilibrated in static and in function according to implant protected occlusion conception. In study group T scan is used as intervention.

II. T Scan bite record

The occlusion will be established utilizing a T-Scan III computerized occlusal analyzing system (Tekscan, Inc., South Boston, MA, USA) after implant crown placement (baseline). This instrument uses a horseshoe shape sensor sensitive to pressure, which is interposition intra-orally, between upper and lower teeth. After the bite by patient on interposition sensor, generations of occlusal data will take place; will be represented in the form of two Dimensional and 3 Dimensional presentations. Columns and bar will represent percentage of force for teeth. Maxillary central incisor width will be recorded utilizing veneer caliper and put into software. Sensitivity for the T-Scan will be adjusted for each patient to simulate the extent of occlusal force in-patient. Reducing maximum 3 pink columns or contact will set correct sensitivity. The patients will be bite on sensor for seconds. Repeating procedure for three times; maximum occlusal force will be selected for analysis. Percentage of force generated on crown of implant and opposing anatomical crown is registered. Consecutively three, Six twelve months after the first visit for equilibration, occlusion will be examined with T-Scan Novus according to above procedure.

III. RECALL AFTER 3,6, 12 MONTHS

The patients will be asked to report for the follow up after 3, 6,12 months for T scan and occlusal equilibration. CBCT will be taken after 12 months of placement of implant prosthesis to evaluate crestal bone level for all the patients.[14,15]

IV. STATISTICAL ANALYSIS

The data thus obtained will be tabulated for further statistical analysis. Data will be analyzed using descriptive and analytical statistical methods. Statistical significance of the mean differences between the measurements in the interval of 12 months will be tested with Student's paired t test Chi square test, and unpaired t-test.

EXPECTED OUTCOME:

Significant reduction of crestal bone loss will occur around implant because of occlusal equilibration carried out at periodic intervals using T scan Novus.

DISCUSSION:

Dental implants effectively and aesthetically rehabilitate the missing teeth and proves to be a successful treatment option. Dental implants bear more Occlusal forces as compared to natural dentition due to absence of periodontal ligaments. Bite force evaluation plays a vital role in predicting the treatment outcome of the prosthesis. Studies related to implants and bone loss were reported by Bhuiyan et al[16] , Ghoshal et al[17] and Shilpa et al[18].

SCOPE:

Based on results from study, modified software can develop to make a new device to measure exact amount of force on implant for better treatment outcome.

LIMITATION:

The study can be further proceeded with inclusion of other parameters to design a protocol which will cater to the needs accordingly sample size is small. A large sample size will give statistically more significant results.

CLINICAL IMPLICATIONS:

This procedure is useful to prevent crestal bone loss by periodic occlusal equilibration using T scan, ultimately result implant success

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