

A Study To Evaluate Soft Tissue Biotype, Gingival Contour And Contact Points Around Dental Implants And Natural Teeth In The Maxillary Anterior Region- An in Vivo Study



Medical Science

KEYWORDS :

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ABSTRACT

OBJECTIVES: To evaluate and compare the esthetic parameters of single tooth implants and natural dentition. To quantify clinical parameters useful as esthetic guidelines which may enable us to obtain a more predictable outcome. To investigate which esthetic parameter shows greater variation in comparison of single tooth implant in the anterior maxillary region and the natural dentition.

METHODOLOGY: Thirty patients were selected for this prospective study. The study evaluated the single tooth implant supported prosthesis in patients who underwent implant placement in anterior maxillary esthetic zone with natural tooth in the same jaw. Patients were recalled three months post cementation of implant supported prosthesis and high quality photographs were taken with D-SLR camera NIKON D 3200 and macrolens along with a set magnification of 1:1. Parameters were assessed and the collected data was statistically analyzed.

RESULTS: We found that there was a statistically significant difference noted in the gingival contour compared between the implant supported prosthesis and natural teeth on the contralateral side. No statistically significant difference was noticed in other esthetic parameters being soft tissue biotype and contact point.

CONCLUSION: This study helped us to quantify certain clinical parameters as esthetic guidelines which will help us to achieve a more predictable outcome in future.

INTRODUCTION

An esthetic implant restoration is one that should resemble a natural tooth in all respects. Both dental and gingival esthetics act together to provide a harmonious smile to the patient. The dental practitioner must be aware of the parameters related to gingival morphology, form, dimension, characterization, surface texture and color. In the recent years, the dentist's esthetic demand in restorative dentistry has increased rapidly, driven by the awareness of beauty and esthetics. The ultimate goal in modern restorative dentistry is to attain "white" and "pink" esthetics in the esthetic zones. "White esthetics" refers to the natural dentition or the restoration of the dental hard tissues. "Pink esthetics" includes the surrounding soft-tissues, which comprises of interdental papilla and gingiva that can enhance or diminish the esthetic result¹.

Despite the great efforts made to achieve the esthetic outcome of implant-supported restorations, esthetic complications, however, may evolve even with the slightest negligence. Therefore, it is important for clinicians to understand the different factors that can affect the implant esthetic outcome. The anterior region, which is also known as aesthetic zone may vary from person to person, it generally includes the maxillary and mandibular incisors, canines and premolars. Restoring teeth in this area is highly demanding in esthetics, and it is in this region that immediate fixed restorations are of greatest benefits².

AIMS AND OBJECTIVES

1. To evaluate and compare the esthetic parameters of single tooth implants and natural dentition.
2. To quantify clinical parameters useful as esthetic guidelines which may enable us to obtain a more predictable outcome.
3. To investigate which esthetic parameter shows greater variation in comparison of single tooth implant in the anterior maxillary region and the natural dentition.

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METHODOLOGY

SOURCE OF THE DATA

The study was conducted on a group of 30 subjects (age group 18-55 years) visiting outpatient department in A.B.Shetty Memorial Institute of Dental Sciences (Nitte University), Derelakatte, Mangalore. Informed consent to participate in the study was obtained from each subject and the permission to use the obtained data for the study.

INCLUSION CRITERIA

1. Age group of 18 years to 55 years.
2. Single tooth implant supported prosthesis in the maxillary esthetic zone with both neighboring teeth and the contralateral natural tooth present.
3. Minimum of 3 months after implant placement.
4. All patients in good health with no systemic diseases.
5. Signed informed consent.

EXCLUSION CRITERIA

1. Less than 3 months after implant placement.
2. Smokers.
3. Untreated periodontal diseases and/or caries.
4. Need of restorative treatment of adjacent teeth.
5. Single tooth implant supported prosthesis in maxillary posterior region and mandibular region.

MATERIALS USED

PHOTOGRAPHY

1. D-SLR camera NIKON D 3200
2. Tamron EF 100 mm f/1.1L Macro IS USM Lens
3. Ring flash

METHODOLOGY

Thirty patients from the department of Prosthodontics,

A.B.Shetty Memorial Institute of Dental Sciences (A constituent college of Nitte University), Deralakatte, Mangalore were selected for the prospective study. All patients requiring replacement of missing tooth or single tooth extraction as a result of root fractures, caries or failed endodontic treatment were selected.

The study evaluated the single tooth implant supported prosthesis in 30 patients who underwent implant placement in anterior maxillary esthetic zone with contralateral natural tooth in the same jaw.

The following esthetic parameters were examined :

1. Soft tissue biotype
2. Gingival contour
3. Contact point

Patients were recalled to the institution 3 months after cementation of the single implant supported prosthesis in the anterior esthetic zone and an informed consent was taken from the patient to carry out the photographic analysis and to use the information obtained from the same for the study.

PHOTOGRAPHIC ANALYSIS

High quality photographs were taken with D-SLR camera NIKON D 3200 and macro-lens along with a set magnification of 1:1. Photographs were taken 3 months post cementation. The set magnification of the macro-lens helped in taking photographs at a fixed focal length thus standardizing all the photographs taken at a fixed distance. A ring flash was attached to the macro-lens to eliminate the shadow formation in photographs of such close range. The patient was made to sit upright and the cheek retractor was kept in place for better visibility. The photographs taken were then transferred to the computer where further evaluation of the esthetic parameters could be carried out.

The soft tissue biotype was categorized as either thin or thick according to the visibility of an underlying periodontal probe. In thick soft tissue biotype the underlying periodontal probe was not visible whereas in thin soft tissue biotype it was visible. The thin soft tissue biotypes are friable, increasing the risk of recession following tooth preparation and periodontal or implant surgery (Fig 1).

The gingival architecture was determined on clinical examination as flat or scalloped. in cases of less interdental papilla volume the gingival architecture was classified as flat which is a predisposing reason to poor esthetics. On the other hand a complete papilla fill featured a scalloped appearance (Fig 2).

The contact points of the implant supported prosthesis and the contralateral natural tooth was also determined by clinical examination as coronal, middle third or apical. The contact points of maxillary teeth are relevant for ensuring optimal 'pink aesthetics' for patients with a high smile line. The presence of the contact points of the tooth determines the soft tissue fill.



Figure 4 : Evaluation of Soft Tissue Biotype



Figure 7 : Evaluation of Gingival Contour of implant supported prosthesis

RESULTS

Thirty patients were scheduled from July 2013 to February 2015 for evaluation and comparison of the esthetic parameters of single implant supported prostheses and the contralateral natural tooth in the maxillary anterior esthetic zone. Three parameters were measured three months post cementation. The data obtained on evaluation of various esthetic parameters were tabulated in Microsoft Excel Sheets and the statistical analysis was performed using IBM SPSS Statistics, Version 22 (Armonk NY: IBM Corp). Descriptive data were presented in the form of Mean, Median, Standard Deviation and Quartiles. McNemar test was used to compare the gingival contour and contact point of the implant supported prosthesis and contralateral natural teeth. P value <0.05 was considered as statistically significant.

Table no.1: EVALUATION OF GINGIVAL CONTOUR BETWEEN IMPLANT SUPPORTED PROSTHESIS AND NATURAL TEETH ON THE CONTRA LATERAL SIDE

This table compares the gingival contour of the single implant supported prosthesis and contralateral natural teeth. A significant difference ($p=0.03$) was shown in the gingival contour between the implant prosthesis and natural teeth on the contralateral side. 26.7% of subjects showed a scalloped gingival architecture in the natural tooth while having a flat contour with respect to the implant supported prosthesis and 3.3% of subjects showed a scalloped gingival contour in the implant supported prosthesis while having a flat contour in the natural teeth.

Table no.2a: EVALUATION OF MESIAL CONTACT POINT BETWEEN IMPLANT SUPPORTED PROSTHESIS AND NATURAL TEETH V/S CONTRA LATERAL NATURAL TEETH.

This table compares the mesial contact points between the single implant supported prosthesis and adjacent teeth when compared with the mesial contact point between the natural teeth on the contra lateral side. 46.7% of subjects showed a coronally placed contact point whereas 53.3% of subjects showed a contact point placed in the middle one-third. There was no statistically significant difference ($p=1.00$) noted between the mesial contact points of the implant supported prosthesis and natural teeth on the contra lateral side involved.

Table no.2b: EVALUATION OF DISTAL CONTACT POINT BETWEEN IMPLANT SUPPORTED PROSTHESIS AND NATURAL TEETH V/S CONTRA LATERAL NATURAL TEETH.

This table compares the distal contact points between the single implant supported prosthesis when compared with the distal contact point between the natural teeth on the contra lateral side. 13.3% of subjects showed a contact point placed in the middle one third of implant supported prosthesis while it was

coronally placed in the natural teeth on the contralateral side. 23.3% of subjects showed a contact point in middle one third of natural teeth whereas it was coronally placed in case of implant prosthesis. The above data showed no statistically significant difference (p=0.55).

Table no.3: EVALUATION OF SOFT TISSUE BIOTYPE OF IMPLANT SUPPORTED PROSTHESIS AND CONTRA LATERAL NATURAL TOOTH.

This table showed that 73.3% of subjects had a thick soft tissue biotype and the remaining 26.7% had a thin soft tissue biotype involving both implant supported prosthesis and contralateral natural tooth .

Table no.1:

| Gingival Contour Flat | | Natural tooth | | Total P-value | McNe- mar test |
|------------------------------------|-----------|---------------|-----------|------------------|----------------------|
| | | Scalloped | | | |
| Implant Supported Prosthesis | Flat | 4(13.3%) | 8(26.7%) | 12(40.0%) | 0.03* |
| | Scalloped | 1(3.3%) | 17(56.7%) | 18(60.0%) | |
| | Total | 5(16.7%) | 25(83.3%) | 30(100.0%) | |

*P<0.05 statistically significant

P>0.05 non significant, NS

Table no.2a:

| Mesial Contact Point Coronal | | Natural Teeth | | | Total P-value | McNe- mar test |
|--|-----------------|-----------------|---------------|---|------------------|----------------------|
| | | Middle third | Apical | | | |
| Implant Sup- ported Prosthe- sis | Coronal | 14 (46.7%) | 0 | 0 | 14 (46.7%) | 1.00 (NS) |
| | Middle third | 0 | 16 (53.3%) | 0 | 16 (53.3%) | |
| | Apical | 0 | 0 | 0 | 0 | |
| Total | | 14 (46.7%) | 16 (53.3%) | 0 | 30 (100%) | |

*P<0.05 statistically significant

P>0.05 non significant, NS

Table no.2b:

| Distal Contact Point Coronal | | Natural Teeth | | | Total P-value | McNe- mar test |
|--|-----------------|-----------------|---------------|---|------------------|----------------------|
| | | Middle third | Apical | | | |
| Implant Sup- ported Prosthe- sis | Coronal | 7 (23.3%) | 7 (23.3%) | 0 | 14 (46.7%) | 0.55 (NS) |
| | Middle third | 4 (13.3%) | 12 (40.0%) | 0 | 16 (53.3%) | |
| | Apical | 0 | 0 | 0 | 0 | |
| Total | | 11 (36.7%) | 19 (63.3%) | 0 | 30 (100%) | |

*P<0.05 statistically significant

P>0.05 non significant, NS

Table no.3:

| Soft tissue biotype | Frequency | | Percent |
|------------------------|-----------|----|---------|
| | Thick | 22 | 73.3% |
| | Thin | 8 | 26.6% |

DISCUSSION

Replacement of a single tooth in this region is one of the most important and difficult tasks to achieve. The tooth can be replaced with a conventional fixed dental prosthesis, which restores the function but, esthetics and the longevity of the adjacent tooth will be hampered. Implant supported single-tooth prosthesis can be a viable treatment option to restore a single missing tooth with an optimal esthetic outcome. In situations where a non-restorable tooth undergoes extraction, a minimum of 3 months after the extraction is recommended for the bone to form before placement of implant ⁵.

A significant difference (p=0.03) was shown in the gingival contour between the implant prosthesis and natural teeth on the contralateral side in this study. 26.7% of subjects showed a scalloped gingival architecture in the natural tooth while having a flat contour with respect to the implant supported prosthesis. A flat gingival architecture results when the interproximal bone involved is thin and the interproximal gingival contour is nearly parallel to the underlying bone contour. In cases of wider availability of interproximal bone, a pronounced or high scallop is achieved⁶.

In this study there was no statistically significant difference (p=1.00) between the contact points on the mesial aspect and distal aspect of implant supported prosthesis and the natural teeth involved. Studies have shown that for square teeth having wider contact points, the incidence of 'black triangles' is minimal compared with triangular teeth having narrow contact points which are more incisally placed⁶.

The thin gingival soft tissue biotype allows visibility of a metal substructure thereby compromising aesthetics in the anterior regions. To avoid such circumstances, all-ceramic crowns, or ceramic implant abutments are a prerequisite to avoid aesthetic drawbacks. Secondly, due to the fragile property of thin soft tissue biotype, careful management is essential for avoiding recession. On the other hand, a thick biotype is fibrotic and resilient and is therefore, more conducive for implant placement, resulting in favourable aesthetic outcomes. The present study showed that 73.3% of subjects had a thick soft tissue biotype and the remaining 26.7% had a thin soft tissue biotype

Within the limitations of the study and the data collected, we can see that there is a higher incidence of asymmetry in the interdental papilla with respect to score 2 in the Jemt index. There was also a correlation seen in between more variation in the gingival architecture and the shape of the tooth involved, ovoid shaped teeth showed a flat scallop.

Within the limitations of the study and data collected, of the various esthetic parameters that were assessed in this study, maximum asymmetry was found in the gingival contour between the implant supported prosthesis and contra lateral natural teeth in the maxillary anterior esthetic zone. Prudent assessment of the gingival zenith and gingival contour prior to implant placement provides the clinician with a foresight into planning soft tissue and hard tissue augmentation procedures for the purpose of achieving superior esthetic outcome. Of equal importance is the evaluation of the tooth shape by the clinician in order to improve the white esthetics and also determine the gingival architecture.

CONCLUSION

Within the limitations of this study, the following conclusions were obtained:

- A significant difference was shown in the gingival contour between the implant supported prosthesis and natural teeth on the contralateral side with 26.7% of subjects show-

ing a scalloped gingival architecture in the natural tooth while having a flat contour with respect to the implant supported prosthesis.

- There was no statistically significant difference noted between the mesial and distal contact points of the implant supported prosthesis and natural teeth on the contra lateral side involved.
- The present study showed that 73.3% of subjects had a thick soft tissue biotype and the remaining 26.7% had a thin soft tissue biotype

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