

Role of Gingival Biotype on Implant Esthetics -An Observational Study

¹Dr. Kavyashree P.M, Post Graduate, Department of Periodontics, A.J Institute of Dental Sciences, Near Kuntikana Road, Kuntikana, Mangaluru, Karnataka 575004

²Dr. Nagarathna D.V, Professor, Department of Periodontics, A.J Institute of Dental Sciences, Near Kuntikana Road, Kuntikana, Mangaluru, Karnataka 575004

Corresponding Author: Dr. Kavyashree P.M, Post Graduate, Department of Periodontics, A.J Institute of Dental Sciences, Near Kuntikana Road, Kuntikana, Mangaluru, Karnataka 575004

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Abstract

Implant dentistry has seen enormous innovations made to achieve primary implant stability and improve bone-to-implant contact. The focus has now shifted towards creating an esthetic restoration that is indistinguishable from natural teeth and is stable over time.

The current progress of dental treatment in implant and perioplastic surgery has led to further expectations among patients to the better esthetics results.

Predictability of post-operative success is a major consideration in treatment planning both for periodontal and implants treatment. Therefore, a careful understanding and analysis of the surrounding tissues is necessary.

In the long run, the success of esthetic restorations depends on various factors like gingival phenotype, gingival tissue architecture and shape of the anterior teeth.

Hence, an accurate diagnosis of gingival tissue biotype is of prime importance in devising an appropriate treatment plan and achieving a predictable esthetic outcome.

Hence, this study reveals the role of gingival biotype for the success of implants.

Keywords: Gingival biotype, Implant esthetics, Recession, Success of implants.

Introduction

The term ‘gingival biotype’ is described as the thickness of the gingiva in the faciopalatal/ labiolingual dimension (1).

The term periodontal biotype introduced by Seibert and Lindhe categorized the gingiva into ‘‘thick-flat’’ and ‘‘thin scalloped’’ biotypes. A gingival thickness of ≥ 2 mm was considered as thick tissue biotype and a gingival thickness of < 1.5 mm was referred as thin tissue biotype (2).

Thick gingival biotype depicts broad zone of keratinized tissue with flat gingival contour which indicates thick underlying bony architecture and is more resilient to inflammation and trauma. While, thin gingival biotype is related with a thin band of the keratinized tissue and scalloped gingival contour suggesting thin bony architecture which is highly sensitive to inflammation or trauma.

Ochsenbien and Ross stated that gingival biotypes are of two types i.e. either scalloped and thin or flat and thick. They also proposed that the underlying bone depicts the contour of the gingival above.(3) Becker et al., proposed

three different periodontal biotypes: flat, scalloped and pronounced scalloped gingival. (4)

Gingival biotype can be evaluated by various methods such as by direct visual assessment, using periodontal probe or by direct measurements using endodontic spreaders, endodontic files and callipers, probe transparency (TRAN) method, ultrasonic devices and cone-beam computed tomography (CBCT). (5)

Materials And Methods

This clinical study consists of 12 cases with 8 females and 4 male patients. The patients were selected from the outpatient department of Periodontics, A.J. Institute of Dental Sciences, Mangalore for replacement of their missing teeth by implant treatment. Selected patients were assessed for the suitable parameters for implant placement and gingival soft tissue biotype of the patients were assessed using Williams's periodontal probe by trans gingival probing method under local anaesthesia.

12 systemically healthy patients were selected for implant placement for their missing teeth. Patients were informed about the study protocol verbally and written consent was obtained from all the patients who were willing to participate in the study.

Inclusion Criteria

1. Males and females aged between 25 and 60 years.
2. The presence of missing teeth ideal for implant placement
3. Patients willing to comply with multiple recall schedules.

Exclusion Criteria

1. Patients with active infection or severe inflammation in areas intended for implant placement.
2. Patients with a history of any systemic diseases or metabolic bone disease which can influence the healing.
3. Patients with a habit of smoking, tobacco chewing and alcohol consumption.

4. Patient with history of parafunctional habits with evidence of severe bruxing and clenching.

5. Pregnant women.

Clinical Evaluation For Gingival Biotype

The Gingival biotype of all the patients were evaluated by trans gingival probing method under local anaesthesia. Measurements were made with a calibrated and standardized Williams periodontal probe by probing the gingiva of the to be placed implant area. The thickness of the gingiva was measured according to probe markings. Based on the gingival thickness measured the patients were divided in to three groups of 1mm, 1.5mm and 2mm gingival thickness. Those below or equal to 1.5 mm was classified as thin and those above or equal to 2 mm were classified as thick gingival biotype.

The Patients were assessed by Gingival recession index (Miller,1985),

Clinical assessment was done at baseline during placement of implant and 6-month postoperatively.

Procedure

Baseline Assessment

At baseline, after the clinical evaluation, patients were divided in to three different groups. Group A, Group B, Group C, with gingival thickness 1mm ,1.5mm and 2mm respectively. Group A had 6 cases (with all female patients), Group B had 2 cases (with 1 male patient) and Group C had 4 cases (with 3 male patient).

Implant Placement

Titanium screwed implant were placed in the selected edentulous area in all the patients after reflecting a full thickness mucoperiosteal flap. Cover screws and sutures were placed.

Post-operative instructions were given. Antibiotics and analgesics were prescribed. All Patients were recalled after 7 days for suture removal.

Reassessment after 3 And 6 Months

After 3 months all the patients were re-evaluated and were given with the implant superstructure prosthesis.

After 6 months all the patients were re-evaluated and clinically evaluated for the gingival biotype and Gingival recession index (Miller,1985).



Figure 1: Gingival biotype with 1mm thickness showing no recession in the 6 months evaluation.



Figure 2: Gingival biotype 1mm thickness showing Class 1 recession in 6 months evaluation.



Figure 3: Gingival thickness with 1.5 mm thickness showing no recession in 6 months evaluation.



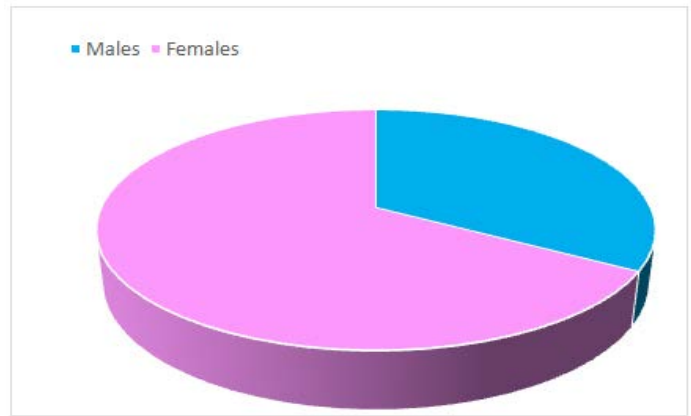
Figure 4: Gingival thickness with 2 mm thickness showing no recession in 6 months evaluation.

Results

In this clinical study, there were total 12 implant cases selected with age ranging from 25 to 54 years (Table 1). Out of which 8 of them were female and 4 were male patients.(Fig.1)

Age group (In years)	No of patients (n)	Percentage (%)
25-34	5	41.66
35-44	4	33.33
45-54	3	25

Table 1: Age wise distribution of the study subjects. (n= 12)



Graph 1: Gender wise distribution of the study subjects.

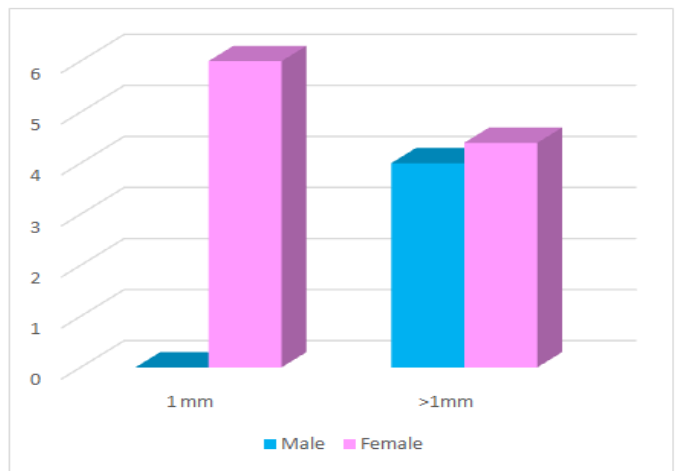


Fig 2: Relation between the occurrence of gingival biotype and the gender.

There were 6 cases of 1mm biotype (thin biotype) with all female patients in this study population, while there were 6 cases of > 1mm (thick biotype) with 4 male patients and 2 female patients indicating the prevalence of thin biotype in females.

Gender	Thick biotype		Thin biotype	
	No	%	No	%
Male	4	100	0	0
Female	2	25	6	75

Table 2: Biotype of the patient on the basics of the Gender.

All the 4 male patients in the study population had thick biotype and 2 out of 8 females had thick gingival biotype while all the other 6 female patients had thin gingival biotype.

Gingival biotype (in mm)	No of patients (n)	Recession (%)
1 mm	6	66.66
1.5 mm	2	0
2 mm	4	0

Table 3: Relation of the gingival recession and the gingival biotype.

Out of 6 cases in group A (1 mm), 4 cases showed class 1 Recession in the 6-month post evaluation. While the other 2 cases belonging to this group showed uneventful healing with no recession. The 2 cases belonging to group B (1.5mm) showed uneventful healing with no recession. Similarly, all the 4 cases of group C (2mm) also showed uneventful healing with no gingival recession.

Gender	No of patients (n)	Recession (%)
Male	4	0
Female	8	50

Table 4: Relation between the gender and the gingival recession.

In terms of gender, all the 4 male patients in the study population showed no recession while 4 out of 8 female patients showed gingival recession (50%).

Age in years	Total no patients	No of patients with recession	Recession %
25-34	5	2	40
35-44	4	1	25
45-54	3	1	33

Table 5: Relation between the Age and the gingival recession.

The study population were divided in to three Age groups; In the age group of 25-35 years there were total 5 patients out of which 2 patients showed gingival recession (40%) while the age group of 35-45 years had total 4 patients with 1 patient showing gingival recession (25%) and the age group of 45-54 years had total 3 patients with 1 patient showing gingival recession (33%).

Age group (In years)	Thick biotype		Thin biotype	
	No	%	No	%
25-34	3	60	2	40
35-44	3	75	1	25
45-54	0	00	3	100

Table 5: Biotype of the patients on the basics of Age group.

There were 40% of thin biotype and 60% of thick biotype in 25-34 years age group, 25% of thin biotype and 75% of thick biotype in 35-45 years age group while 100% of thin biotype in 45-54 years of age group was seen in this study population indicating there is reduction of gingival biotype as the age progresses.

Discussion

One of the key factors that predetermine the outcome of dental implant treatment is Gingival Tissue biotype. Initial thickness of the gingiva predicts the outcome of the Implant or any other restorative treatment procedure. It is suggested that the thin gingival biotype is more likely to lead to the occurrence of gingival or periodontal disease. Similarly, the thick flat tissue biotype is an essential factor for the successful implant esthetics.

Adequate thickness of attached gingiva is essential, as a thin and delicate gingival margin may lead to recession after trauma, surgical, or inflammatory injuries while the thick gingival tissue eases manipulation, maintain vascularity, and promote wound healing during and post surgical procedure.

The gingival biotype is gaining considerable attention as one of the key elements influencing esthetic treatment outcome. Patients with a thick gingiva have been shown to be relatively resistant to gingival recession following Implant, surgical and/or restorative therapy.

Similarly, in this clinical study the 2 cases belonging to group B (1.5mm) thick gingiva showed uneventful healing with no recession. Similarly, all the 4 cases of group C (2mm) thick gingiva also showed uneventful healing with no gingival recession.

According to a study by Müller and Eger, periodontal phenotype had been described as either thick which is associated with a square form of maxillary incisors or thin which is associated with slender tooth form.(6) In a study by De Rouck et al., the thin gingival biotype occurred in one-third of the study population and was most prominent among women, whereas the thick gingival biotype occurred in two-thirds of the study population and occurred mainly among men.(7)

In this clinical study, 12 implant cases were selected with age ranging from 25 to 54 years. Out of which 8 of them

were female and 4 were male patients. There were 6 cases of 1mm biotype (thin biotype) with all female patients in this study population, while there were 6 cases of > 1mm (thick biotype) with 4 male patients and 2 female patients indicating the prevalence of thin biotype in females.

The thickness of the gingival and bone tissues affects the treatment outcomes, possibly due to a difference in the amount of blood supply to the underlying bone, and the susceptibility to resorption. Soft tissue thickness and contours are important diagnostic factors that influence the esthetic outcome of an implant restoration.

Thick biotypes show greater dimensional stability during remodeling compared to thin biotypes. It is assumed that in thick biotypes, the presence of lamina bone adjacent to the outer cortical plate provides the foundation for metabolic support of the cortical bone and hence its stability and sustainability. In thin biotypes, where the lamina bone is scarce or absent, the cortical bone is subjected to rapid resorption.(8)

This clinical study showed no recession in the thick gingival biotype group while there was 66.66 % recession seen in the thin biotype group. In terms of gender, in this study population all the 4 male patients in the study population showed no recession while 4 out of 8 female patients showed gingival recession (50%).

Current research seems to indicate that keratinized mucosa may be useful in preventing mucosal recession,(8) facilitating oral hygiene practices, hiding restorative margins, and camouflaging the shadow from the titanium implant platform.

In implant therapy, advanced bone grafting is required in complex cases where the residual bone volume is inadequate for housing the dental implant. A thick tissue biotype is said to have an increased blood supply which enhances the revascularization of bone grafts, which in turn increases healing and graft incorporation. Thin tissues

may actually compromise the collateral blood supply to the surgical site (9) and another advantage of thick tissues is the ability to attain and maintain primary wound closure.

The true value of having a thick tissue biotype is it enhances primary wound coverage, providing vascularity, site protection, and stability for regeneration around the implant and is more resistant to mucosal recession or mechanical irritation and is capable of creating a barricade to conceal restorative margins.

A recent study by Nisapakultorn et al found that peri-implant tissue biotype was significantly associated with facial marginal mucosal level. Also, patients with a thin biotype had less papilla fill and an increased risk of peri-implant facial mucosal recession.(10)

In thick biotype, significantly, less bone loss is seen after implant placement as compared to thin biotypes.(11) In a thick biotype environment, immediate placement of an implant can be completed with predictable results. In case of thin biotype cases, the possibility of significant resorption, which has direct impact on esthetics, is high. A delayed implant placement is preferred when the thickness of the periodontal tissues is inadequate. In thin biotype cases, pre-emptive biotype enhancement may be considered.

In this study population there was 40% of thin biotype and 60% of thick biotype in 25-34 years age group, 25% of thin biotype and 75% of thick biotype in 35-45 years age group while 100% of thin biotype in 45-54 years of age group was seen in this study population indicating there is reduction of gingival biotype as the age progresses. Thick biotype decreased with advancing age.

This clinical study shows that there is more prevalence of thin and scalloped gingival biotype than thick and flat gingival biotype occurring among the female population. This clinical study reflects that the thin gingival biotype is

more prone to gingival recession than thick gingival biotype after implant placement or any other surgical procedures.

A pre-existing thin gingival biotype can impede ideal esthetic result of many therapies. In such a scenario, gingival biotype can be enhanced. This can be done to achieve more stable results to avoid soft tissue relapse. It can also aid in achieving more esthetic results. A study demonstrated that bone loss can be controlled in thin biotype patients, if the biotype is augmented prior to the placement of implant.(13)

Few procedures that can be performed to enhance the biotype of gingival tissue are the use of connective tissue grafts, a cellular dermal matrix, platelet-rich fibrin (PRF) membrane, fetal membrane such as amnion or chorion membrane.(14)

Another emerging concept in patients with thin biotype is that of a flapless approach for implant placement. This prevents the disruption of blood supply to alveolar bone which would be occurring in a full thickness flap. According to the studies, use of flapless approach led to minimal papillary recession and bone loss in thin gingival biotype patients. (12) Also, the laser micro- textured implant collar is said to prevent proximal bone loss in thin biotype cases. (11)

Although no definitive clinical trial has been conducted to thoroughly examine the influence of peri-implant tissue biotype on implant aesthetics, it can be inferred from the available literature that tissue biotype does play a crucial role in creating an esthetic implant-supported restoration.

Conclusion

A thick soft tissue biotype is an essential factor that has positive impact on the aesthetic outcome of implant restorations as it is more resistant to mechanical and surgical insults, and is less susceptible to mucosal recession and has more tissue volume for prosthetic

manipulation. A thorough knowledge of the nature of tissue biotype can help a practitioner employ suitable clinical techniques which minimize soft tissue loss , alveolar resorption and provide a more favourable tissue environment.

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