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RESEARCH ARTICLE

Gingival Biotype: A Key to Successful Aesthetics–Its Role and Functions–Observation-Based Research

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ABSTRACT

To achieve primary implant stability and enhance bone-to-implant contact, implant dentistry has seen significant advancements. The emphasis is now on developing an aesthetic restoration that blends in with natural teeth and is long-lasting. Patients now have higher expectations for improved aesthetics due to dental treatment advancements in implant and perioplastic surgery. Planning the best course of action for periodontal and implant therapy involves considering how predictable post-operative outcomes will be. Therefore, a thorough comprehension and examination of the surrounding tissues is required. The long-term success of aesthetic restorations is influenced by a number of variables, including gingival phenotype, gingival tissue architecture, and anterior tooth shape. Therefore, determining the gingival tissue biotype accurately is crucial to developing a suitable treatment strategy and obtaining a predictable aesthetic result. As a result, this study demonstrates how important gingival biotype is to the success of implants.

Keywords: Dental Implants Success, Gingival Biotype, Gingival Phenotype, Recession.

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1. Introduction

The thickness of the gingiva in the faciopalatal/labiolingual dimension is referred to as the "gingival biotype". The Seibert and Lindhe phrased periodontal biotype distinguished between "thick-flat" and "thin-scalloped" biotypes of the gingiva. A gingival thickness of more than 2 mm was referred to as a thick tissue biotype, and less than 1.5 mm was a thin tissue biotype [1], [2]. Solid bone architecture and a wide zone of keratinized tissue are indicators of a thick gingival biotype, which is also more resistant to inflammation and trauma. A small band of keratinized tissue and a scalloped gingival contour, however, suggest a thin bone architecture that is extremely vulnerable to inflammation or trauma.

According to Ochsenbien and Ross, there are two different gingival biotypes: flat and thick or scalloped and thin. They also suggested that the gingival contour above is represented by the underlying bone [3]. Three separate periodontal biotypes—flat, scalloped, and pronounced scalloped gingival—were proposed by Becker *et al*. [4].

There are several ways to examine gingival biotype, including direct visual inspection, periodontal probing, or precise measurements made using endodontic spreaders, endodontic files, and calipers, the probe transparency (TRAN) method, ultrasonic equipment, and cone-beam computed tomography (CBCT) [5].

2. Materials and Methods

There are 10 individuals in this clinical investigation, including 6 female patients and 4 male individuals. For implant treatment to replace their missing teeth, the patients were chosen from the outpatient department of Bharaj Life Care Hospital and Trauma Centre, Hoshiarpur. Under local anaesthesia, Williams' periodontal probe was used to analyse the gingival soft tissue biotype of selected patients in order to determine the parameters that would be most appropriate for implant implantation. For the placement of dental implants to replace their missing teeth, 10 patients in good overall health were chosen. Patients were verbally informed about the study protocol, and written agreement was obtained from all patients who agreed to participate in the research.

2.1. *Inclusion Criteria*

The inclusion criteria are as follows:

1. Males and females between the ages of 25 and 60.
2. The need for implant insertion due to tooth loss.
3. Patients who are ready to follow various recall regimens.

2.2. *Exclusion Criteria*

The exclusion criteria are as follows:

1. Patients with significant inflammation or active infection in the implant-targeted locations.
2. Patients who have had any systemic illnesses or metabolic bone problems in the past that could have an impact on the healing.
3. Patients who regularly smoke, chew tobacco or drink alcohol.
4. Patients who have a history of parafunctional behaviours and who show excessive clenching and grinding.
5. Expectant mothers.

2.3. *Gingival Biotype Clinical Evaluation*

All patients had their gingival biotypes assessed using the trans gingival probing technique while under local anaesthesia. The gingiva surrounding the area where the implant will be placed was probed using a calibrated and standardised Williams periodontal probe to take measurements. The markings on the probe were used to measure the gingiva's thickness. The patients were sorted into three clusters based on the assessed gingival thickness: 1 mm, 1.5 mm, and 2 mm. The thin gingival biotype was defined as less than 1.5 mm, whereas the thick gingival biotype was defined as more than 2 mm. The patients were evaluated using the Gingival Recession Index [6], and clinical evaluations were performed at baseline, during implant placement, and six months after surgery.

2.4. *Procedure of Baseline Screening*

Following the clinical evaluation, patients were first split up into three categories: with gingival thicknesses of 1 mm, 1.5 mm, and 2 mm, respectively Group A, Group B, and Group C. There were 4 cases in Group A (all females), 2 cases in Group B (one male), and 4 cases in Group C (with 3 males).

2.5. *Implant Placement*

After establishing a full-thickness mucoperiosteal flap, titanium threaded implants were inserted in the chosen edentulous location in all patients. Sutures and cover screws were used. Guidelines for recovery were given. It was advised to take analgesics and antibiotics. After seven days, all patients were summoned back for suture removal.

2.6. *Reevaluation at 3 and 6 Months*

All of the patients underwent reevaluation at three months and received the implant superstructure prosthesis. All of the patients underwent a clinical evaluation for the gingival biotype and gingival recession index at the 6-month mark [6].

TABLE I: Age Breakdown of the Study Participants (n = 10)

No. of patients	Age group	Percentage (%)
25–35	3	30
36–45	4	40
46–58	3	30

TABLE II: The Patient's Biotype Basedon the Elements of Gender

	Thin biotype		Thick biotype	
	No. of subjects	Percentage (%)	No. of subjects	Percentage (%)
Female	5	100	1	20
Males	0	0	4	80

TABLE III: The Relationship Between Gingival Biotype and Gingival Recession

No. of patients (n)	Gingival biotype (in mm)	Recession (%)
4	1	75
2	1.5	0
4	2	0

TABLE IV: Association Between Gender and Gingival Recession

No. of patients	Gender	Recession (%)
4	Male	0
6	Female	50

3. Results

There was a total of 10 implant cases chosen for this clinical investigation, with people aged from 25 to 58 years (Table I). Six of them were female patients, and four were male.

In this study participants, there were 5 occurrences of 1 mm biotype (thin biotype), with all patients being female, compared to 5 cases of more than 1 mm biotype (thick biotype), with 4 male subjects and 1 female subjects (Table II), showing how common the thin biotype is in females.

One out of six female study subjects had a thick gingival biotype, while the remaining five female patients all had a thin gingival biotype. All four of the study's male subjects had a thick biotype (Table III).

Three of the four instances in group A (1 mm) that were evaluated six months after the act displayed class 1 Recession. As opposed to the other case in this group, which healed without incident and without a recession. Two instances from group B (1.5 mm) demonstrated uncomplicated healing and no recession. Similar to group B's instances, all four of group C's (2 mm) cases displayed uneventful recovery and no gingival recession (Table IV).

Regarding gender, there was no gingival recession in any of the 4 male study participants; however, there was a gingival recession in 3 of the 6 female participants (50%) (Table V).

4. Discussion

The gingival tissue biotype is one of the major variables that foretell how dental implant treatment will turn out.

TABLE V: Association Between Age and Gingival Recession

Total no. of patients	No. of patients with recession	Age in years	Recession (%)
3	0	25–35	0
4	2	36–45	50
3	1	46–58	33

The gingiva's initial thickness can determine how well an implant or other restorative treatment would work. It is hypothesised that gingival or periodontal disease is more prone to develop in those with thin gingival biotypes. Similar to the previous example, the thick, flat tissue biotype is crucial to the attractiveness of an implant.

A thin and sensitive gingival edge may cause recession after trauma, surgery, or inflammatory injuries, whereas a thick gingival tissue is easier to manipulate, maintains vascularity, and aids in wound healing both before and after surgery, adequate thickness of attached gingiva is therefore crucial.

One of the crucial factors affecting the success of aesthetic treatment is the gingival biotype, which is drawing a lot of attention. The effects of implant, surgical, and/or restorative therapy on gingival recession have been proven to be less severe in patients with thicker gingiva.

Similar to this, in this clinical research, the two instances with thick (1.5 mm) gingiva from group B underwent uneventful recovery with no recession. Similar to this, all four cases of group C's thick (2 mm) gingiva displayed uncomplicated recovery with no gingival recession.

In a study by Müller *et al*. [7], the periodontal phenotype was divided into two categories: thick, which is related to a square shape for the maxillary incisors, and thin, which is associated with a slender tooth shape. According to a study by De Rouck *et al*. [8], women made up one-third of the study group and had a higher prevalence of the thin gingival biotype than men, who made up two-thirds of the study population.

Ten implant cases were chosen for this clinical investigation, spanning in age from 25 to 54. Six of them were female patients, and four were male. In this study population, there were 5 cases of 1 mm biotypes (thin biotypes) with all female patients, compared to 5 cases of > 1 mm biotypes (thick biotypes) with 4 male patients and 1 female patient, showing the prevalence of thin biotypes in females.

The treatment results are influenced by the thickness of the gingival and bone tissues, probably as a result of differences in the amount of blood flow to the underlying bone and susceptibility to resorption. An implant restoration's cosmetic outcome is significantly influenced by the thickness and shape of the soft tissue.

Comparatively speaking, thick biotypes have stronger structural stability during remodelling than thin biotypes. It is hypothesized that in thick biotypes, the presence of lamina bone close to the outer cortical plate serves as the building block for the cortical bone's metabolic support, which in turn contributes to its longevity and stability. Cortical bone is rapidly resorbed in thin biotypes when lamina bone is either scant or missing [9].

In this clinical investigation, the group with a thick gingival biotype experienced no recession, but the group with a thin biotype experienced a 75% recession. In terms of gender, all four of the study's four male participants showed no gingival recession, while three out of the study's six female participants displayed gingival recession in 50% of cases.

Advanced bone grafting is necessary in complex situations of implant therapy when the remaining bone volume is insufficient to support the dental implant. An enhanced blood supply in a thick tissue biotype is thought to facilitate bone graft revascularization, which in turn promotes healing and graft integration. Thick tissues also have the advantage of being able to achieve and maintain primary wound closure, whereas thin tissues may potentially damage the collateral blood supply to the surgical site [9]. The real benefit of having a thicker tissue biotype is that it improves initial wound coverage, offers circulation, site protection, and stability for regeneration surrounding the implant, is more robust to mucosal recession or mechanical irritation, and can build a wall to hide restorative margins [10].

This sample group had a 100% thick biotype in the 25–34 age group, 50% thin biotype and 50% thick biotype in the 35–45 age group, and 75% thin biotype and 25% thick biotype in the 45–54 age group, demonstrating that gingival biotype decreases with age. Age-related declines in thick biotype. This clinical investigation demonstrates that among the female population, thin and scalloped gingival biotypes are more common than thick and flat gingival biotypes. This clinical investigation shows that after implant surgery or any other surgical operation, the thin gingival biotype is more likely to experience gingival recession than the thick gingival biotype [11].

Acellular dermal matrix, platelet-rich fibrin (PRF) membrane, connective tissue grafts, amnion or chorion membrane, and platelet-rich fibrin (PRF) membrane are a few techniques that can be used to optimize the biotype of gingival tissue. The idea of using a flapless technique to place implants in patients with thin biotypes is another recent development. As a result, the disruption of the blood supply to the alveolar bone that would result from a full-thickness flap is avoided.

According to research, patients with thin gingival biotypes who underwent flapless surgery experienced low papillary recession and bone loss [12]. Additionally, it is claimed that the laser micro-textured implant collar prevents proximal bone loss in thin biotype patients [13].

It can be concluded from the available literature that tissue biotypes do play a significant role in producing an aesthetically pleasing implant-supported restoration, even though no conclusive clinical trial has been conducted to thoroughly examine the impact of peri-implant tissue biotypes on implant aesthetics.

5. Conclusion

Being more resilient to physical and surgical trauma, less prone to mucosal recession, and having more tissue volume for prosthetic manipulation, a thick soft tissue biotype is a crucial element that positively affects the cosmetic outcome of implant restorations. A physician can use therapeutic approaches that decrease soft tissue

loss, and alveolar resorption, and create a more favorable tissue environment by having a full understanding of the characteristics of each tissue biotype.

Conflict of Interest

Authors declare that they do not have any conflict of interest.

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