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ASSOCIATION OF GINGIVAL BIOTYPE AND FLAP DESIGN CONSIDERED AT STAGE TO UNCOVERY - A RETROSPECTIVE STUDY

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Abstract

AIM: *To evaluate association between gingival biotype and flap design consideration at the time of stage two uncovery.*

MATERIAL AND METHOD: *A retrospective study was done in which 528 implants were placed from 1 June 2019 till 1 March 2020 were included. Data was reviewed from the patients records and analysed the data of 86,000 patients between June 2019 and March 2020 that were documented in a private institution. Statistical analysis was performed to assess the Association between gingival biotype and flap design consideration at the time of stage two uncovery.*

RESULTS: *Gingival biotype had no significant difference when compared between males and females and different age groups. Flap design consideration had no significant difference when compared between males and females, but the difference was statistically significant when seen between different age groups. There was a statistically significant association between gingival biotype and flap design consideration at the time of stage two uncovery ($p<0.05$).*

CONCLUSION: *There is significant association between gingival biotype and flap design consideration at the time of stage two uncovery. Therefore, it should be one of the factors considered during planning of implant placement in a particular case for successful implant treatment.*

KEYWORDS: *Gingival biotype, Flap design, Implant placement, Bone resorption, Hard tissue.*

Introduction

Dental implant is a prosthetic device made of alloplastic material[s] implanted into the oral tissues beneath the mucosal and/or periosteal layer and on or within the bone to provide retention and support for a fixed or removable dental prosthesis; a substance that is placed into and/or on the jaw bone to support a fixed or removable dental prosthesis (1). Dental implants mimic the tooth root and help in replacing the missing tooth for function and esthetic (2,3). Gingival biotype influences implant treatment (4)-(5,6). The responses of different gingival biotypes to different types of trauma, inflammation, systemic treatment with medications, restoration and various treatments is different (7–10).

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Seibert and Lindhe classified gingiva as 'thick and flat' and 'thin and scalloped'. Thick gingiva is when it is ≥ 2mm and gingiva is considered thin when it is less than 1.5 mm (7). According to Becker et al there are 3 types of biotypes according to its measurement from the height of bone interproximally to midfacial height : flat, scalloped and pronounced gingiva (11).

Gingival biotype can vary mainly in anterior region, in anterior region there can be three gingival biotypes (12–14). Anterior square shaped teeth might have thick gingival biotype, this is most favourable for implants, as it prevents recession by supporting the marginal gingiva, when the crestal bone is resorbed or when during implant placement flap is raised (15–18). Conical tooth with thin gingival biotype is least favourable for implants, as it will not prevent recession, when the crestal bone is resorbed or when during implant placement full thickness flap is raised (19–22).

There are various types of flap designs used for implant placement and at the time of stage 2 uncovery. According to older school of thoughts full thickness flap is commonly used. But various studies have demonstrated that full thickness flap reflection leads to bone resorption and post surgical tissue loss (23–26). According to recent studies, the flapless technique is said to have a minimized approach and helps in preserving the soft tissue architecture and helps improving patient comfort and satisfaction (27–31). It helps to maintain the periosteum intact, in turn maintaining better blood supply, thus reducing bone resorption (12,13).

Gingival biotype and flap design are related to the soft tissue and hard tissue healing, and amount of bone resorption is different for different biotypes and the type of flap used (32). Hence this study aimed to evaluate association between gingival biotype and flap design consideration at the time of stage two uncovery.

MATERIAL AND METHODS:

A retrospective study was done in a private institution. Ethical clearance number was SDC/SIHEC/2020/DIASDATA/0619-0320. The clinical portion of this retrospective study was conducted over a 9 month period i.e from 1 June 2019 to 1 March 2020 and included patients who had undergone implant placement. A total of 528 implants were evaluated for gingival biotype and its associated flap design used for stage two recovery after implant placement.

Inclusion Criteria : Stage two recovery patients, Age within 25 to 50 years, Both males and females, Non-smokers and non-alcoholic.

Exclusion Criteria: Any systemic disease, Pterygoid or Zygomatic implant placed.

The data of 86,000 patients documented between June 2019 and March 2020 were reviewed and analysed. The data collected was entered, tabulated and analysed for seeing the association between the gingival biotype and flap design used for stage two recovery after implant placement. Statistical analysis was done using SPSS Statistics Software for windows, version 20.0. Pearson correlation was done to determine that is there any statistical significant difference between gingival biotype and flap design consideration at the time of stage two recovery.

RESULTS:

Out of 528 patients, 27.1% implants were placed in the age group of 26-35 years. 59.5% of the patients were Males. Out of the total population 64.6 % had thick gingival biotypes. For 77.1% of the patients full thickness flap was considered for stage two recovery.

Association of gingival biotype and gender showed that 63.1% of males had thick gingival biotype and 66.8 % female had thick gingival biotype (Table 1). Association of choice of flap design and gender for males showed that for 78.3% flap design used was full thickness flap, for 8.3% linear incision was used and for 13.4% punch cut was used (Table 1). Association of choice of flap design and gender for females showed that for 75.2% flap design used was full thickness flap, for 14% linear incision was used and for 10.7% punch cut was used (Table

1). Association of gingival biotype and flap design according to age has been shown in Table 2. There was no statistically significant difference when comparison was done in gender and gingival biotype and gender and choice of flap design considered at the time of stage two recovery. There was a statistically significant difference when flap design was compared in different age groups ($p<0.05$) (Figure 1). Association between gingival biotype and flap design according to gender was not statistically significant (Table 3). Association between gingival biotype and flap design according to age was not statistically significant for thick biotype but was statistically significant for thin gingival biotype (Table 4). When correlation was done between gingival biotype and flap design considered at the time of stage two recovery, there was a statistically significant difference seen (Table 5, Figure 2).

		Gender		Chi-square value	P value
		Male	Female		
Gingival Biotype	Thick	63.1%	66.8%	0.789	0.374
	Thin	36.9%	33.2%		
Flap Design	Full Thickness Flap	78.3%	75.2%	4.825	0.090
	Linear Incision	8.3%	14.0%		
	Punch cut	13.4%	10.7%		

Table 1: Association between gender and gingival biotype, gender and flap design. Chi-square test was done, p value was 0.374 showing that it is statistically not significant, proving that there is no association between gender and gingival biotype. Association between gender and flap design used had p value of 0.09 showing that it is statistically not significant.

		Age					Chi-square value	P value
		18-25	26-35	36-45	46-55	Above 55		
GingivalBiotype	Thick	55.1%	69.2%	65.6%	65.8%	59.8%	4.378	0.357
	Thin	44.9%	30.8%	34.4%	34.2%	40.2%		

Flap Design	Full Thickness Flap	73.5%	77.6%	84.0%	78.9%	67.0%	17.11	0.029*
	Linear Incision	6.1%	10.5%	7.2%	14.0%	13.4%		
	Punch cut	20.4%	11.9%	8.8%	7.0%	19.6%		

*The Chi-square statistic is significant at the 0.05 level.

Table 2: Association between age and gingival biotype, age and flap design. Chi-square test was done, p value was 0.357 showing that it is statistically not significant, proving that there is no association between age and gingival biotype. Association between age and flap design showed p value of 0.029, proving that in the age group of 18-25 years punch cut was used more frequently than other age groups.

			Gender		Chi-square value	P value
			Male	Female		
Gingival Biotype	Thick	Full Thickness Flap	88.4%	81.8%	2.909	0.088
		Linear Incision	11.6%	18.2%		
		Punch cut	0.0%	0.0%		
	Thin	Full Thickness Flap	61.2%	62.0%	1.281	0.527
		Linear Incision	2.6%	5.6%		
		Punch cut	36.2%	32.4%		

Table 3: Association between gingival biotype and flap design according to gender. Chi-square test was done, p value was 0.088 and 0.527 showing that it is statistically not significant, proving that there is no association between gingival biotype and flap design according to gender.

			Age					Chi-square value	P value
			18-25	26-35	36-45	46-55	Above 55		
Gingival Biotype	Thick	Full Thickness Flap	92.6%	86.9%	89.0%	84.0%	77.6%	5.167	0.271
		Linear Incision	7.4%	13.1%	11.0%	16.0%	22.4%		
		Punch cut	0.0%	0.0%	0.0%	0.0%	0.0%		
	Thin	Full Thickness Flap	50.0%	56.8%	74.4%	69.2%	51.3%	16.86	0.032*
		Linear Incision	4.5%	4.5%	0.0%	10.3%	0.0%		
		Punch cut	45.5%	38.6%	25.6%	20.5%	48.7%		

*The Chi-square statistic is significant at the 0.05 level.

Table 4: Association between gingival biotype and soft tissue healing according to age. Chi-square test was done, p value was 0.271 showing that it is statistically not significant, proving that there is no association between thick gingival biotype and flap design used according to age. But association between thin gingival biotype and flap design used according to different age groups showed p value of 0.032, proving that there is highest frequency of punch cut type of flap design used in patients above 55 years of age with thin gingival biotype.

FlapDesign	Gingival Biotype		Chi-square value	P value
	Thick	Thin		
Full Thickness Flap	85.6%	61.5%	140.512	0.000*
Linear Incision	14.4%	3.7%		

Punch cut	0.0%	34.8%		

*The Chi-square statistic is significant at the 0.05 level.

Table 5: Association between gingival biotype and soft tissue healing. Chi-square test was done, p value was 0.000 showing that it is statistically significant, proving that there is association between gingival biotype and flap e frequently used for thin gingival biotype.

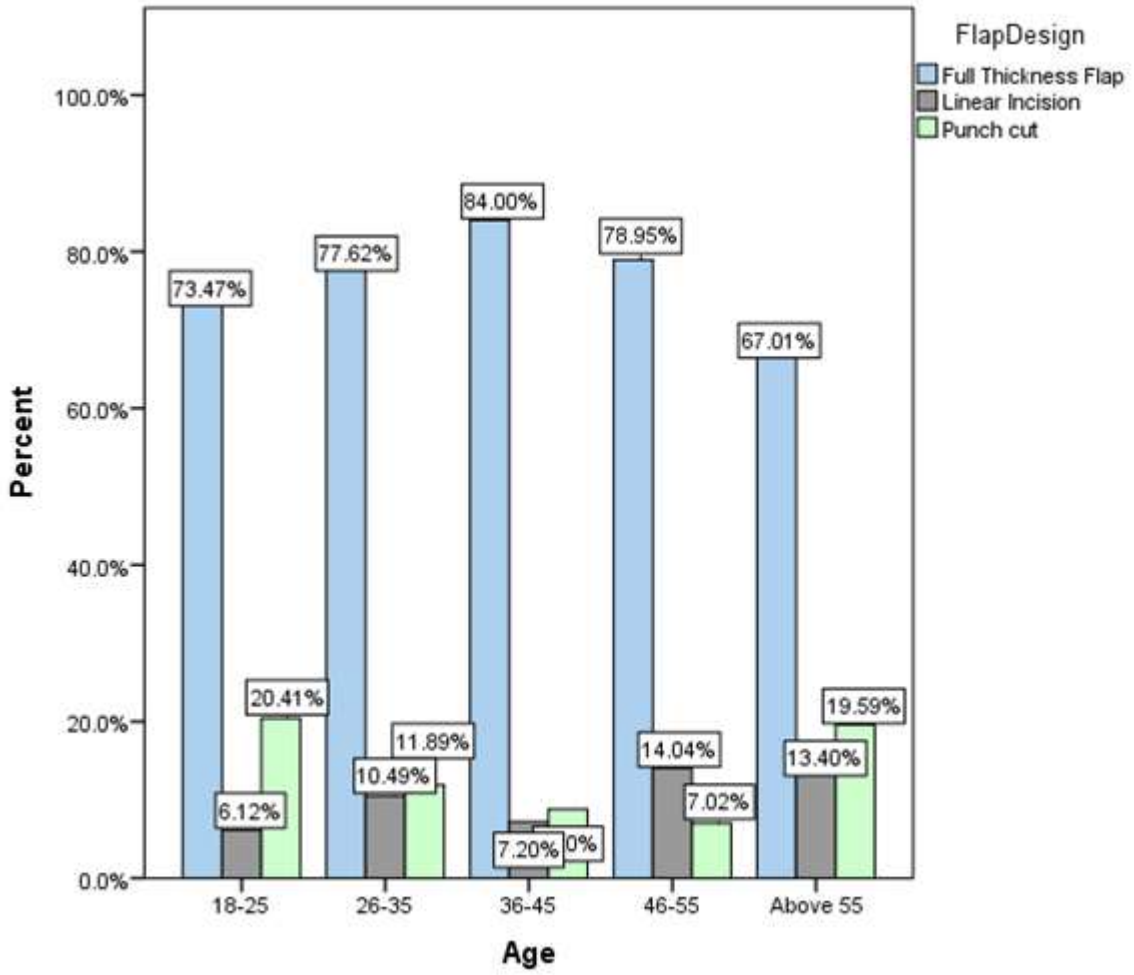

Figure 1: Bar graph showing association between age and flap design for stage two uncovery. X-axis represents different age groups involved in this study and Y-axis represents percentage distribution of the type of flap design used. Blue colour represents full thickness flap, Mauve colour represents linear incision and Pale green colour represents punch cut. Chi-square test was done and association was found to be significant. Pearson's Chi-square value: 17.118, p value: 0.029 (<0.05) hence statistically significant, proving that there is association between age and flap design used for stage two uncovery.

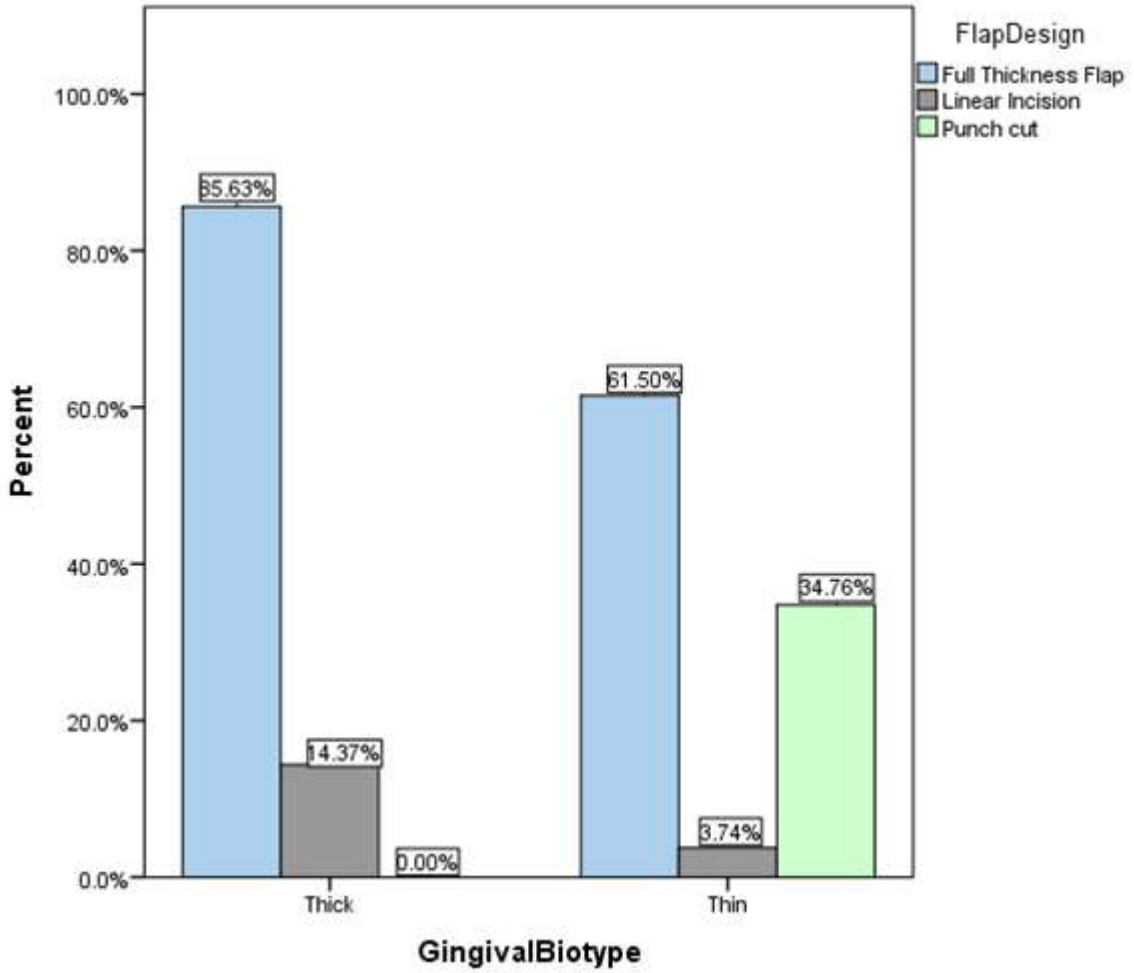

Figure 2: Bar graph showing association between gingival biotype and flap design used for stage two uncovery. X-axis represents gingival biotype and Y-axis represents percentage distribution of flap design. Blue colour represents full thickness flap, Grey colour represents linear incision and Pale green colour represents punch cut. Chi-square test was done and association was found to be significant. Pearson's Chi-square value: 140.512, p value: 0.000 (<0.05) hence statistically significant, proving that there is association between biotype and flap design used for stage two uncovery and that punch cut is used more commonly for thin gingival biotype.

DISCUSSION:

This study aimed to evaluate whether the gingival biotype can influence flap design consideration at the time of stage two recovery. There was a significant difference between flap design consideration at the time of stage two recovery between thick and thin gingival biotypes. Gingival biotypes were introduced to literature in the 1980s, since then there have been many studies done for characterizing the biotypes and for prediction of the various treatment options (33). There have been many studies who relate periodontal therapy outcome to gingival biotype.

Gingival biotype varies according to age and gender. Previous studies have shown that the thickness of gingiva goes on decreasing as the age increases, but in our study there was no significant relationship between the age of the patient and thickness of gingiva (18,34,35). The study also showed that thick gingiva is most commonly seen in females, but in our study males had thick gingiva when compared to females (36,37).

There are various types of flaps designs which can be considered while going for stage two recovery (38). Punch flap is used when there is 2-3 mm keratinized gingiva present . It uses a puch cut or BP blade to have precise cuts (13,39). The only disadvantage is loss of keratinized tissue (9). Full thickness flap has shown to cause periosteal disruption which leads to loss of blood supply to the bone as the whole periosteum is raised, due to

which there can be bone resorption due to hypoxia of the surrounding bone (40–42). Hence, for all the cases there should be careful selection of the type of flap used, particularly as the crestal bone resorption affects the implant success rate.

Limitation of our study is that it is done in an institutional setting, hence there are limited samples. As it is an institutional study there can be operator bias, protocol bias seen. The clinical scenarios around the implant placed in our study were not the same as there were different operators and different clinical conditions.

Before going for implant surgery according to the type of biotype of the patient incision line should be planned. For thin gingival biotype, more conservative flap design should be chosen, so that the interdental papillae are preserved (43,44). Hence, the choice of flap design should be done according to the biotype, so that there is no loss of hard or soft tissue.

CONCLUSION:

Within the limitations of our study, we conclude that the gingival biotype commonly found in the South Indian population is thick. There is significant association between gingival biotype and flap design consideration at the time of stage two uncovery. Flap design is related to the age of the patient. Therefore, it should be one of the factors considered during planning of implant placement in a particular case for successful implant treatment.

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AUTHOR CONTRIBUTION:

First author (Minal Tulsani) performed the analysis and interpretation and wrote the manuscript. Second author (Subhashree R) contributed to conception, data design, analysis, interpretation and critically revised the manuscript. Both authors have discussed results and revised the manuscript.

CONFLICT OF INTEREST:

The authors declare no conflict of interest, financial or otherwise.

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