Comparison of Efficacy of Acellular Dermal Matrix (ADM) Allograft with Free Gingival Graft (FGG) for Gingival Depigmentation : A Clinical Study

Dr. Pallavi Thakre
Sr. Lecturer
Dept. of Periodontics
V.Y.W.S Dental College & Hospital
Amravati (Maharashtra)

Dr. M.L. Bhongade
Professor & HOD
Dept. of Periodontics
Sharad Pawar Dental College
Sawangi (Meghe), Wardha (Maharashtra)

Dr. Pournima Godge
Professor
Dept. of Oral Pathology & Microbiology
Terna Dental College & Hospital
Navi Mumbai

Dr. Ritika Jaiswal
Sr. Lecturer
National Dental College
Derabassi, Punjab.

Abstract

Gingival pigmentation is a social problem. Present study was aimed to compare ADMA with FGG for Gingival Depigmentation. 10 individuals with gingival pigmentation were assigned to ADMA and FGG groups. Clinical Parameters were measured at baseline, 6 weeks and 3 months postsurgically viz: DOPI (Area and severity of pigmentation), PI, PBI and assessment of pain. At 6 weeks no repigmentation was observed in test and control group but assessment of pain was 0.25 in ADMA and 1 in FGG.

Conclusion: Both ADMA and FGG can be effectively used in the elimination of gingival pigmentation. However ADMA causes less discomfort.

Keywords : Gingival Depigmentation, Acellular Dermal Matrix (ADM), Free Gingival Graft

Introduction

The colour of healthy gingiva is often affected by the melanin pigmentation as a result of an abnormal deposition of the melanin by the melanocyte mainly located in the basal and suprabasal cell layer of the epithelium.[5] The degree of pigmentation depends on melanocyte activity. Gingival hyperpigmentation beyond the normal expected degree may be caused by a variety of physiological and pathological condition. Since dark gingival pigmentation is undesirable to some persons, it may cause psychological problems for these patients, especially those to whom appearance is of vital importance. Therefore, many individuals, particularly young male and female with severe melanin pigmentation contact dentist's to overcome what they feel are a defect in their social presentation.

Attempts have been made to answer these cosmetic demand by various methods including gingivectomy,[4] electrosurgery,[10] cryosurgery,[26] chemical agents such as 90% phenol and 95% alcohol[15], abrasion with diamond bur,[8] Nd:Yag Laser,[2] diode laser,[28] Carbon-dioxide laser[18]. Tamizi and Taheri (1996)[16] used free gingival autograft to eliminate dark gingival pigmentation in 10 patients, and reported no evidence of repigmentation after 4.5 years. Despite the good long term outcomes, this technique presents limitations such as additional surgical site, limited amount of donor tissues and unesthetic final clinical appearance resulting from color and texture differences between labial and palatal tissues (Schulman 1996).[20]

Recently, the use of ADM has been successfully reported as a substitute for free gingival autograft in order to increase width of attached gingiva and to promote root coverage in gingival recession (Novaes et al 2001, Harris 2002, Harris 2004).[19,12,11] Despite some histological similarities between free gingival graft and ADM (Dodge et al 1998),[6] the latter has advantages as it avoids a second surgical site to obtain donor tissues, provides unlimited amount of graft material, and produces predictable and satisfactory esthetic results ((Novaes et al 2001, Harris 2002)[19,12.] Novaes et al[20] in their case report described the use of ADM to eliminate gingival pigmentation and reported no signs of repigmentation upto 24 months after surgery. Therefore, the present study was undertaken to compare the effectiveness of acellular dermal matrix (ADM) allograft (Biohorizons) with free gingival graft (FGG) for gingival depigmentation.

Material and Methods

Study Population : Ten patients with healthy gingiva (6 Females and 4 Males) aged between 16 to 40 years (mean age 24.8 ± 5.26 years) with physiologic gingival pigmentation on facial surfaces of anterior region were treated in the present study. The Inclusion criteria were systemically healthy young adults with wide, uniformly dense bands of physiologic gingival pigmentation, extending from the marginal gingiva to the Mucogingival junction on the facial aspects of anterior region and who were more conscious about their aesthetics and were anxious to undergo the treatment for elimination of pigmentation. The exclusion criteria were history of habits like smoking, tobacco chewing and other related habits during the last six months and history of any relevant systemic disease, which caused the hyperpigmentation.

After proper examination and diagnosis, initial therapy consisted of oral hygiene instructions; supragingival and subgingival scaling was performed. Plaque control instructions were repeated until the patients achieved a plaque score of 1. A re-evaluation examination was performed after 6 weeks following completion of initial therapy.

A total of 10 patients with diffuse gingival pigmentation on the facial surface of upper anterior regions were treated in the present study. 5 patients were treated by Acellular dermal matrix (ADM) allograft with partial thickness flap while 5 patients were treated with Free Gingival Graft (FGG). Prior to the surgery, procedure was explained to the patients and informed consent form was signed by every patient.

Clinical Measurements : (I) Assessment of plaque and gingival status: On the day of the surgical procedure, full mouth plaque score was assessed by plaque index (Turkesy Gilmore Glickman modification of Quigley-Hein1970)[27] and gingival inflammation by papillary bleeding index (Muhleman H.R 1977).[17]

(II) Assessment of Gingival Pigmentation: Gingival pigmentation was assessed by measuring the area of pigmentation on facial surfaces of anterior segment from canine to canine. The severity of gingival pigmentation was assessed by using Dummetts oral pigmentation index (Dummett CO1980).[7]

(a) Measuring the Area of Pigmentation : A rectangular shaped cellophane paper was used to measure the area of pigmentation. It was adapted in the patient's mouth and with the help of glass marking pens, the teeth were traced as reference points and the area of pigmented gingiva was outlined. The tracing was then removed from the oral cavity, washed, dried and kept on a graph paper. The numbers of squares included in the tracing were counted (N). At each visit the same tracing sheet was used to measure the area of pigmentation and repigmentation if any with the help of previously marked reference points and tracing; (Fig. 1,2). It was then superimposed on a graph paper to measure the area in number of squares (n). This was converted into a percentage value using the following formula-

$$A = \frac{n \times 10}{N}$$

Where,

A-Percentage area of repigmentation,

N-Area in number of squares preoperatively,

n-Area in number of squares postoperatively

(b) Severity of Gingival Pigmentation: Severity of gingival pigmentation was recorded in relation to each gingival unit by using following scale.

Score: 0-Pink tissue (No clinical pigmentation)

1- Mild light brown tissue (Mild clinical pigmentation)

2- Medium brown or mixed brown and pink tissue (Moderate clinical Pigmentation)

3- Deep brown/ blue-black tissue (Heavy clinical pigmentation)

Gingival pigmentation score per person was obtained by dividing the sum of the assigned estimates of pigmentation to each gingival unit divided by the total number of gingival units examined.

(III) Post-Operative Evaluation of Pain: After the completion of surgical procedure the patients were subsequently called on the next day and again after seven days for the assessment of pain by using following crireria as described by Gedalia and Brayer 1978.[9]

0-No pain

1-Discomfort but cannot be said as pain

2-Mild pain

3-Moderate pain

4-Severe pain

Surgical Procedure: Immediately before the Surgical treatment, the Patients were made to rinse the mouth with 0.2% Chlorhexidine Gluconate Solution for 1 minute. Asepsis was maintained through out the entire procedure. The areas subjected to surgery was anesthesied by infiltration anesthesia, using Local anesthetic solution 2% xylocaine with 1:1,00,000 epinephrine. A Shallow horizontal incision was placed by using Bard Parker Surgical blade number 15 over the mucogingival junction on the facial aspect. An incision was extended from distal line angle of left Canine to distal line angle of right canine. Vertical incisions were made distal line angle of left Canine and at distal line angle of right canine. The recipient bed was prepared **(**Fig. 3,4) by initiating Partial thickness flap from mucogingival junction in such a way that the underlined bone surface would remain covered with Periosteum and Connective Tissue.

After the recipient site was completely prepared, the selection of FGG or ADM treatment was made by coin toss.

In case of ADM (Test) group, the ADM **(**Fig. 5) was hydrated in a sterile saline dish for 10 minutes according to the manufacturer's recommendation. The graft was then trimmed to shape and size designed to cover the prepared recipient site. During the placement of the ADM the connective tissue side (i.e. the red side) was placed on the recipient bed while the basement membrane side (i.e. the white side) was placed towards the outer side. The ADM was stabilized with simple interrupted 4-0, 5-0 vicryl sutures. Slight pressure was applied to the area with saline-soaked gauze for approximately 2 minutes, to adapt the graft well to the recipient site.

In case of FGG (Control) group, the graft was harvested from the palate between the Maxillary first Molar and Maxillary Cuspid.. A template of the recipient site was made with tin foil to ensure adequate graft size. **(**Fig.6) An incision was made in the palate parallel to the Maxillary First Molar and canine at a distance of approximately 3mm apical to the gingival margin. Perpendicular incision was then made to establish the width of the graft for covering the entire area of the recipient site. A Split thickness section of 1-2mm thick graft was elevated. The Free Gingival Graft was removed with a periosteal elevator. The Free Gingival Graft was then placed on a saline gauge pad and irrigated with saline. It was then modified as per the required dimension after removal of excess fatty and glandular tissue. The graft was placed in closed contact with the recipient site and held in placed by simple suture of 4-0 silk. Immediately after surgery Periodontal dressing was placed on the recipient site and at the donor site.

Post-Operative: After assessment of pain one week following surgery, periodontal pack was removed and the healing was observed. The patients were recalled at 3month following surgical treatment and clinical measurements recorded pre-operatively were repeated. **(**Fig.8)

Results

10 Systemically healthy Patients presenting with diffuse Gingival Pigmentation in maxillary anterior region from distal of left canine to distal of right canine were included in the surgical treatment protocol. In 5 Patients de-pigmentation was carried out with acellular dermal matrix (ADM) allograft and in remaining 5 patients de-pigmentation was done with Free Gingival Graft (FGG).

During the course of the study, the wound healing of (ADM) and (FGG) was uneventful. In all 10 Patients, the areas that were de-pigmented either by using ADM or FGG no evidence of depigmentation was seen during the study period. None of the selected patients dropped out during the study and all the patients were satisfied with the appearance of the gingiva following surgery. All the patients were ready to continue the suggested de-pigmentation treatment in other pigmented area.

In general patients showed satisfactory improvement in oral hygiene and gingival condition throughout the study .

In test group, mean area of pigmentation was 338 ± 43.24 and mean score for severity of pigmentation was 2.2 ± 0.44 at baseline and no repigmentation was observed during 3 months post surgical period. In control group mean area of pigmentation was 352 ± 26.12 and mean score for severity of pigmentation was 2.0 ± 0.71 at baseline and no repigmentation was observed during 3 months post surgical period. (Table1).

In test group, the mean score for the severity of pain at 7-10 days, it was 1.2 ± 0.45 and at 6 weeks 0.2 ± 0.45 with a mean reduction of 1.00 ± 0.71. In control group the mean score for severity of pain at 7-10 days, it was 3.4 ± 0.45 and at 6 weeks 1.2 ± 0.45 with a mean reduction of 2.2 ± 0.45. The mean score for severity of pain was more in control group than test group, both at 7 to 10 days, and at 6 weeks. (Table-2)

Discussion

In the present study, acellular dermal matrix (ADM) allograft was compared with free gingival graft (FGG) to evaluate effectiveness in the elimination of gingival pigmentation. There was no sign of allergy, infection or any other complication in any patient after the use of ADM allograft, which indicates that the product Acellular dermal matrix (Alloderm)® was well tolerated and nonimmunogenic. Each patient participating in the study showed a good oral hygiene level and a healthy clinical gingival condition throughout the study period as indicated by the reduction in plaque index (PI) and papillary bleeding index (PBI) score. Out of 10 patients, 5 were treated with acellular dermal matrix (ADM) allograft and remaining 5 patients were treated with free gingival graft. The findings of the present clinical study showed that both acellular dermal matrix (ADM) allograft and FGG were found to be effective procedure to eliminate gingival pigmentation. (Fig. 8,9)

The findings of the present study are consistent with the case report of a Novaes Jr. and colleagues[20] who treated bilateral gingival pigmentation by using ADM on one side and epithelial abrasion on the other side and reported that the ADM graft had completely integrated to the recipient tissues, resulting in a very good cosmetic appearance. Clinical repigmentation did not occur up to 2 years after surgery on ADM side, while it recurred after 6 months on the epithelium abrasion side.

The outcomes from the present study indicate that FGG presents satisfactory and comparable improvement in terms of depigmentation with that of ADM, with no repigmentation was observed during the period of 3 months. These findings are comparable with previous report. Tamizi and Taheri (1996)[16] treated 10 patients of severe gingival pigmentation by using FGG autograft and reported no evidence of repigmentation after 4.5 years. However, FGG graft present disadvantages such as the great amount of donor tissue needed to cover the area of pigmentation, which extended typically from the central incisor to the canine or first bicuspid. In addition, post operative pain and discomfort often assosciated with donor site. Moreover, the esthetic outcome of free gingival grafts does not seem to be as favorable as that seen with ADM.

The mechanism of gingival repigmentation is not understood but according to migration theory, (Perimutter S 1986, Hu F et.al. 1959)[22,15] active melanocytes from the adjacent pigmented tissues migrate to treated areas, causing failure. The successful results observed with FGG could be because of fact that when non pigmented palatal mucosa was grafted, the migration of

adjacent active melanocyte was perhaps stopped by basal epithelial layers of the graft. During the preparation of the recipient tissues to receive the ADM, as the flap is dissected, only a few or may be no epithelial ridges are likely to remain in the connective tissue. Thus, during the healing process, migration of inactive melanocytes from the surrounding, that is, nonpigmented areas, would hamper repigmentation (Sharon et al 2000).[24] The satisfactory esthetic result obtained with ADM is also attributed to the fact that, being an acellular collagen membrane, its healing occurs through the repopulation of cells and revascularization, which leads to the formation of tissues with similar characteristics, particularly in color and texture to the surrounding tissues (Tal 1999).[25] (Fig. Case 1 and 2)

Conclusion

The results of present study have demonstrated that both the procedures, use of ADM as well as FGG were found to be effective for gingival depigmentation. However, there was less postoperative discomfort and pain in ADM group as compared to FGG, therefore patient compliance was better in ADM group. Despite the positive results obtained with the use of both ADM allograft and FGG longitudinal evaluation with large sample size are needed in order to verify long-term results

References

1. Alex A Farnoosh,Treatment of gingival pigmentation and discoloration for esthetic purposes. Int J Periodont Restor Dent 1990.10:1115-1122.
2. Atsawasuwan P, Greethong K, Nimmanon V. Treatment of gingival hyperpigmentation for esthetic purposes by Nd:YAG laser: report of 4 cases, J Periodontol 2000;71:315-321.
3. Batista EL Jr., Batista FC, Novaes AB Jr. Management of soft tissue ridge deformities with acellular dermal matrix. Clinical approach and outcome after 6 months of treatment. J Periodontol 2001;72: 26573.
4. Bergamaschi O., Kon S., Doine A. I., Ruben M. P. Melanin repigmentation after gingivectomy: A 5 year clinical and transmission electron microscopic study in humans. Int J Periodont Restor Dent 1993; 13:85-92.
5. Breathnach A.S As cited in textbook of "Oral mucosa in health and disease". Edited by Dolby AE. Edition I. Blackwell Scientific Publications. Page 53.
6. Dodge JR, Henderson R, Greenwell H. Root coverage without a palatal donor site, using an acellular dermal graft. Periodontal Insights 1998; 5:59.
7. Dummett CO, J.S. Sakamura and G.Barens. The relationship of the facial skin complexion to oral mucosa pigmentation and tooth color.J Prosth Dent. 1980; 43:392-396.
8. Esen E, Haytac MC, Oz IA, Erdogan O, Karsli ED. Gingival melanin pigmentation and its treatment with the CO2 laser. Oral Surg oral Med Oral Pathol Oral Radiol Endod 2004; 98:522-527
9. Gedalia I, Brayer L, Kalter N and Richter N. The effect of fluoride and strontium application on dentin in vivo and in vitro studies. J Periodontol. 49; 262, 1978.
10. Gnanasekhar J.D.,Al- DuwairiY.S. Electrosurgery in dentistry.
11. Harris RJ. A short-term and long-term comparison of root coverage with an Acellular dermal matrix and a subepithelial graft. J Periodontol 2004;75: 73443.
12. Harris RJ. Cellular dermal matrix usedfor root coverage: 18-month follow-upobservation. Int J Periodont Restor Dent 2002;22: 15663.
13. Harris RJ.Soft tissue ridge augmentations with an acellular dermal matrix. Int J Periodont Restor Dent 2003;23:8792.
14. Hasegawa A, Okagi H. Removing melagenous pigmentation using 90 percent phenol with 95 percent alcohol. Dent Outlook 1973;42:673-676.
15. Hu F, Fosnugh RP, Leney PF. In vitro studies on vitiligo. J Invent Dermatol 1959; 57:48-50.
16. Mahmoud Tamizi,Morteza Taheri.Treatment of severe physiologic gingival pigmentation with free gingival auto graft.Quitessence Int 1996; 27: 555-558.
17. Muhlemann H. R. Psychological and chemical mediators of gingival health. J Prev Dent 1977; 4-6.
18. Nakamura Y, Hossain M, Hirayama K, Matsumoto K. A clinical study on the removal of gingival melanin pigmentation with the CO2 laser. Lasers Surg Med 1999;25:140-147.
19. Novaes AB Jr., Grisi DC, Molina GO, et al. Comparitive 6- month clinical study of a subepithelial connective tissue graft and Acellular dermal matrix graft for the treatment of gingival recession.J Periodontol 2001; 72: 1477-84.
20. Novaes AB Jr., Pontes CC, Souza SL, et al. The use of Acellular dermal matrix allograft for the elimination of gingival melanin pigmentation. A case report with 2 years of follow-up. Pract Proced Aesthet Dent 2002; 14:619-623.
21. Novaes AB Jr.,Souza SLS. Acellular dermal matrix graft as a membrane for guided bone regeneration: a case report. Implant Dent 2001; 10:192 196
22. Perimutter S, Tal . Repigmentation of the gingiva following surgical injury. J Peripdontol 1986; 57:48-50.Quitessence Int 1998; 29: 649-654
23.Schulman J. Clinical evaluation of an Acellular dermal allograft for increasing the zone of attached gingiva. Pract Proced Aesthet Dent 1996; 201-8.
24. Sharon E, Azaz B, Ulmansky M. Vaporization of melanin in oral tissues and skin with a carbon dioxide laser: a canine study. J Oral Maxillofac Surg 2000; 58:13871393.
25. Tal H. Subgingival acellular dermal matrix allograft for the treatment of gingival recession: a case report.J Periodontol 1999;70:11181124.
26. Tal H., Landsberg J., Kozlovsky A. Cryosurgical depigmentation of the gingiva. A case report. J Clin Periodontol 1987; 14:614-617.
27. Turesky S, Gilmore, Glickman. Reduced plaque formation by the chloromethyl analogue of vitamin C. J Periodontol 1970; 41: 41-49.
28. Yousuf A, Hossain M, Nakamura Y,Yamada Y, Kinoshita J,Matsumoto M.Removal of gingival pigmentation with the semiconductor diode laser: a case report. J Clin Laser Med Surg 2000, 18:263-266.

Table 1
Area and Severity of Gingival Pigmentation in Test and Control Group at Baseline (MV ± SD)

Parameters	Test Group Group (ADMA)	Control Group (FGG)	Difference	P-Value
Area of Pigmentation	338±43.24	352±26.12	36±11.94	NS
Area of Pigmentation	338±43.24	352±26.12	36Å11.94	NS
Severity of Pigmentation	22±0.44	20±0.71	0.6±0.55	NS
NS = p > 0.05				

Table 2
Comparison of Severity of Pain between Test & Control Group at 7-10 days an 6 Weeks (MV±SD)

Group	7-10 Days	6 Weeks	Difference	P-Value
Test Group (ADMA)	1.2±0.45	0.2±0.45	1.00±0.71	S
Control Group (FGG)	3.4±0.45	1.2±0.44	2.2±0.45	S
Difference	S	S		
S = p > 0.05				

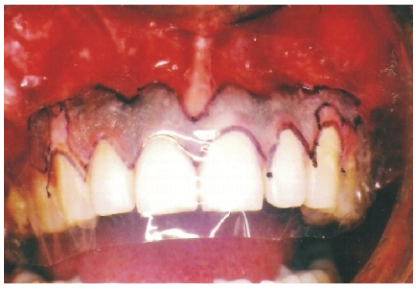


Fig. 1 : Marking the Area of Pigmentation by using Cellophane paper

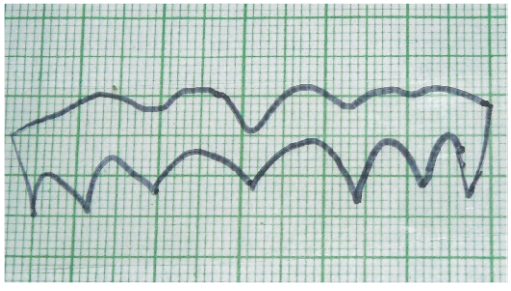


Fig. 2 : Measured Area of Pigmentation.

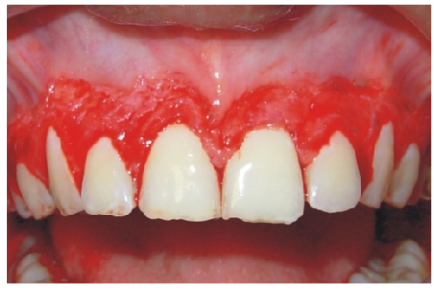


Fig. 3 : The recipient site after reflection of Partial thickness flap

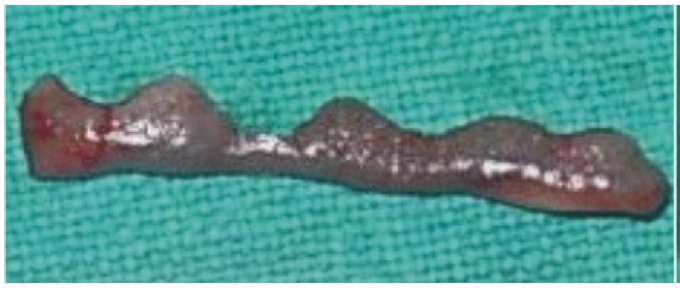


Fig. 4 : Partial thickness flap removed and discarded

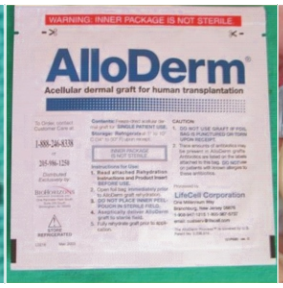


Fig. 5 : Alloderm

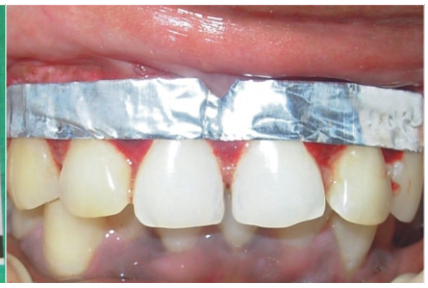


Fig. 6 : Sterile template of aluminium foil

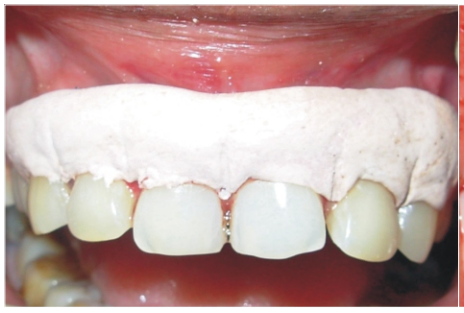


Fig. 7 : Placement of Periodontal pack

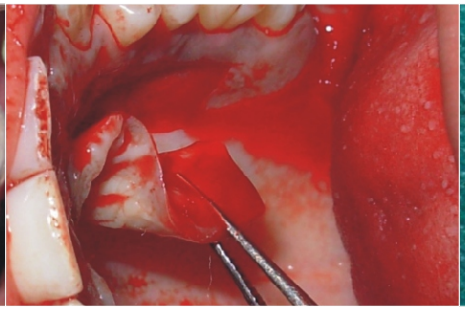


Fig. 8 : Partial thickness flap reflected

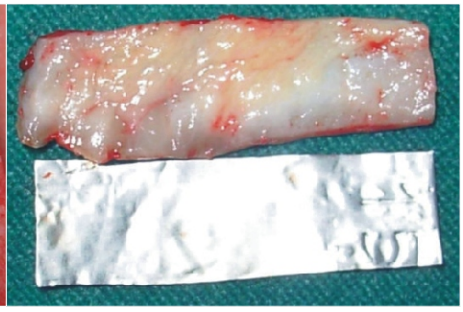
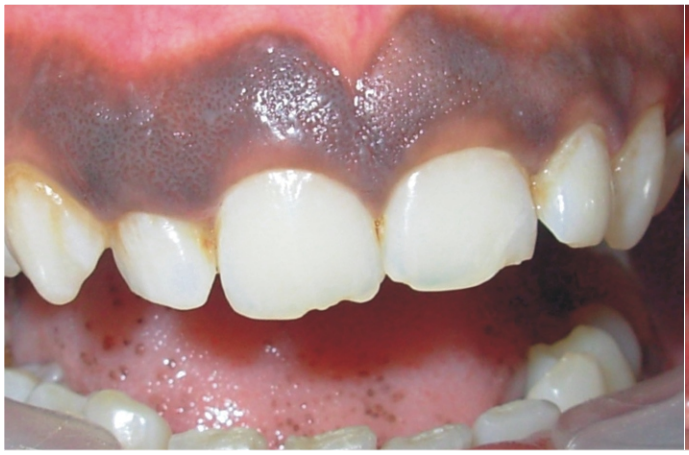


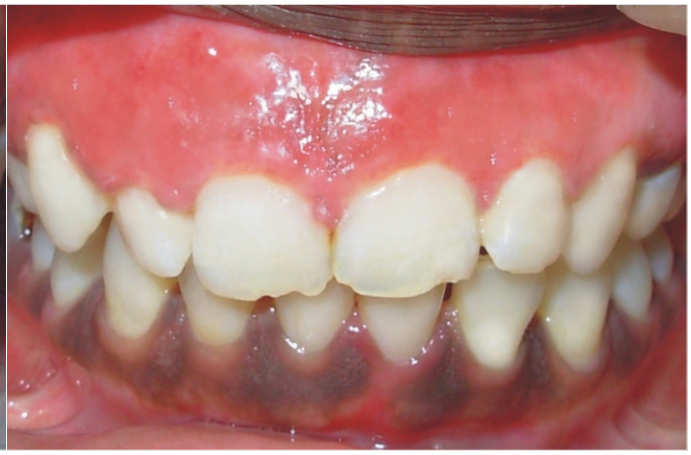
Fig. 9 : Free gingival graft harvested from palate

Photographs of The Test (ADMA) Group

Case-I

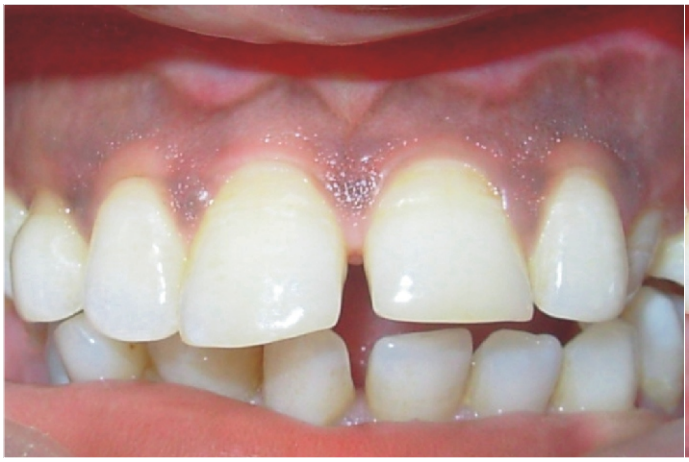


Pre-Operative

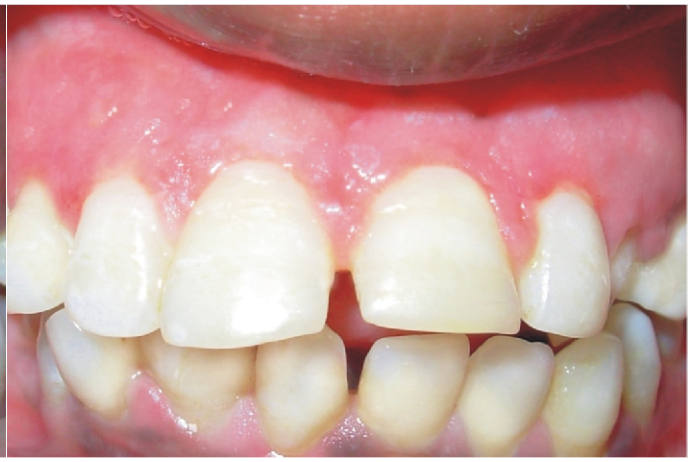


Post-Operative of 3 months

Case-II



Pre-Operative



Post-Operative of 3 months