IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 25, Issue 5 Ser. 4 (May. 2026), PP 28-32
www.iosrjournals.org

Evaluating The Efficacy Of Locally Delivered Vitamin C Along With Microneedling In The Treatment Of Deficient Interdental Papilla

Dr. Bharti Singh[1], Dr. Shalabh Mehrotra[2], Dr. Sweta Yadav[3], Dr. Shivani Mishra

Department Of Periodontology And Oral Implantology, Teerthanker Mahaveer Dental College And Research Centre, Delhi Road, Moradabad (Up), India.
[1], Pg Student,Department Of Periodontology And Oral Implantology, Teerthanker Mahaveer Dental College And Research Centre, Moradabad, India
[2]Head Of Department, Department Of Periodontology And Oral Implantology, Teerthanker Mahaveer Dental College And Research Centre, Moradabad, India
[3]Assistant Professor, Department Of Periodontology And Oral Implantology, Teerthanker Mahaveer Dental College And Research Centre, Moradabad, India

Abstract:
Background*: Vitamin C injection along with microneedling can be considered as an alternative to invasive surgical procedure in Reconstruction of Interdental papilla. This study aimed to evaluate the efficacy of locally delivered vitaminC along with microneedling in the treatment of deficient interdental papilla over three months.*
Materials and Methods*: fifteen patients with class 1 and class 2 interdental papillary loss according to Nordland and tarnow classification 1998 were selected. After oral prophylaxis and baseline measurement,the area was anesthetized with infiltration technique,an insulin syringe(30guage,0.30mm) was used to deposit vitamin c, the needle was injected 2-3mm apical to the involved papilla , each involved papilla was injected to a point till blanching was visible (approx 0.5-1ml) after that, microneedling was done in the required area with a lancet needle (28guage, 0.32mm). This method was repeated 5 times at 10 days interval consecutively. Statistical analysis included wilcoxon sign rank test.*
Results*: Comparison of black triangle height between baseline and 3 months showed no statistically significant change over the study period. The mean black triangle height remained unchanged at 1.333 ± 0.487 both at baseline and at 3 months.*
Key Word: *Interdental papilla reconstruction; Microneedling; Vitamin C.*

Date of Submission: 19-05-2026 Date of Acceptance: 29-05-2026

I. Introduction

open gingival embrasure “black triangles” are defined as the embrasures cervical to the interproximal contact that is not filled by gingival tissues.[1] Consequently, Open gingival embrasures or black triangles are complex aesthetic and functional problems. Among these problems is that they are noticeably unaesthetic which negatively affects the smile, facilitate retention of food debris which can negatively affect the health of the periodontium.[2] Black triangles are present in more than one third of all adults but are more frequent in adult patients who suffer bone loss[3]

Vitamin C is a proven anti-inflammatory agent and also exerts a reducing and antioxidant effect, scavenges free radicals, and acts as an enzyme cofactor in cells. Vitamin C has a very important role in collagen biosynthesis (collagen type I), as it helps in fibroblasts proliferation. It reduces the potentiality of scaring via inhibiting cross-linking of collagen fibers and fibrosis. It acts as a cofactor in hydroxyproline synthesis to produce collagen type IV and improves endothelial cell vitality and function.[4]

Vit C, a vital nutrient, possesses multiple physiological functions, including the formation of blood vessels, cartilage, muscle tissue, and collagen. As a potent antioxidant, it protects the cells from damage by free radicals, supports the immune system, aids in tissue repair, and enhances the absorption of iron from plant-derived foods. Vit C promotes the biosynthesis of collagen and extracellular matrix, thus imparting a central role in regenerative medicine. Due to mutation of the gene encoding gulonolactone oxidase Vit C cannot be synthesized in the human body and needs to be supplied externally through diet. [5]

Microneedling (MN) technique is a non surgical procedure that is known as collagen induction therapy involving repetitive punctures on the skin. In dermatology, MN has been utilized considerably in recent years as it is an effective, simple, economical, well-tolerated, and cosmetically and therapeutically beneficial

procedure.The MN serves to separate the cells instead of cutting through forming microconduits which increases the skin's permeability and blood flow into the epidermis. This process facilitates the penetration of topical medications across the stratum corneum layer. Besides, growth factors are produced promoting the regeneration of collagen and elastin [6]

A variety of MN products have been developed to treat scarring and wrinkles, enable skin rejuvenation, and improve skin appearance. Clinical trials over the last several years have shed light on the applications of MN beyond cosmetic indications, including actinic keratoses (AK), disorders of pigmentation, hyperhidrosis, and striae. Additionally, the role of MN in the treatment of hair pathology has become a recent field of focus as it is thought to stimulate stem cells in the dermal papilla, increase blood flow to hair follicles, and recruit growth factors and signaling pathways which induce hair restoration. MN is also postulated to induce normal wound healing, specifically by breaking collagen strands in the superficial dermis and inducing collagen synthesis immediately under the epidermis. This mechanism is the guiding principle behind the application of MN in the treatment of scars of various etiologies. [7]

While many clinical investigations have been documented, on the effectiveness of the MN technique in treating scars and wrinkles, promoting skin rejuvenation, and managing pigmentation disorders, scarce dental studies have been conducted on its application in the oral cavity, Building upon recent evidence, the current study utilizes the synergistic effects of microneedling and Vitamin C to address Black Triangle. Previous research has demonstrated that this combination significantly fills the black triangle space. By implementing this minimally invasive protocol, the present study aims to further validate the efficacy of creating microchannels to enhance the delivery of vitamin C for superior aesthetic and enhancing deficient interdental papilla in esthetic zones

II. Material And Methods

The patients for study were selected from the OPD of periodontology. All participants in the study were provided with an overview of the clinical trial and guidelines. Patients were selected after obtaining the written informed consent & patient with class 1 & class 2 interdental papillary loss according to Nordland & Tarnow classification 1998.

Study Design: A clinical interventional study was conducted

Study Location: The study was conducted in teerthanker mahaveer dental college in the department of periodontology and implantology, Moradabad, Uttar Pradesh.

Sample size: 15 patients.

Sample size calculation: Using G power Version 3.1.9.6 Programme written by Franz Faul University, Based on the 85 percent power of the study and 5 percent type I error and effect size of 0.80 the sample size came out to be 15 subjects

Inclusion criteria:
1. Patients willing to undergo treatment.
2. Class 1 and Class 2 interdental papillary recession according to Nordland and Tarnow classification, 1998.
3. Age group of 25-40 years.
4. Patients willing to comply by the oral hygiene instructions.

Exclusion criteria:
1. Patients receiving orthodontic treatment.
2. Smoker.
3. Patients who are medically compromised.
4. Pregnant females and lactating mothers.

Procedure methodology

After selection of patient,phase 1 therapy was performed & oral hygiene instruction were reinforced. The papillary height was measured using UNC-15 probe from papillary tip till the contact point of deficient interdental papilla. The area was anesthetized using lidocanie 2% with adrenaline (1:80,000) by infiltration technique. An insulin syringe (30gauge,0.30mm) was used to deposit vitamin C (lifestar mankind pharma pvt. Ltd.). The needle was injected 2–3 mm apical to the involved papilla and all surrounding areas. A single-point injection technique was employed. Each involved papilla was injected with an amount till blanching was

visible(approximately 0.5-1ml). After that, Microneedling was done in the required area with a lancet needle(28gauge,0.32mm). This method was repeated for 5 times at 10 days interval consecutively.

Fig.1 Pre-op Black Triangle space wrt 31,41

Fig.2 Measurement of BTH

Fig.3 Injecting Vit. C

Fig.4 Microneedling using Lancet Needle

Statistical analysis

The data for the present study was entered in the Microsoft Excel 2007 and analyzed using the SPSS statistical software 23.0 Version. The descriptive statistics included mean, standard deviation frequency and percentage. The level of the significance for the present study was fixed at 5%. The comparison was done using the Wilcoxon Sign Rank test. The Shapiro–Wilk test was used to investigate the distribution of the data and Levene's test to explore the homogeneity of the variables.

III. Result

Table no 1 Comparison of black triangle height between baseline and 3 months

	Mean	N	Std. Deviation	Std. Error Mean	P value
Baseline	1.333	15	0.487	0.125	1.000(Non-Sig)
3 Months	1.333	15	0.487	0.125	

Comparison of black triangle height between baseline and 3 months showed no statistically significant change over the study period. The mean black triangle height remained unchanged at 1.333 ± 0.487 both at baseline and after 3 months. This difference was not statistically significant ($p = 1.000$), indicating that the vitamin C intervention did not have any measurable effect on black triangle height within the duration of the study.

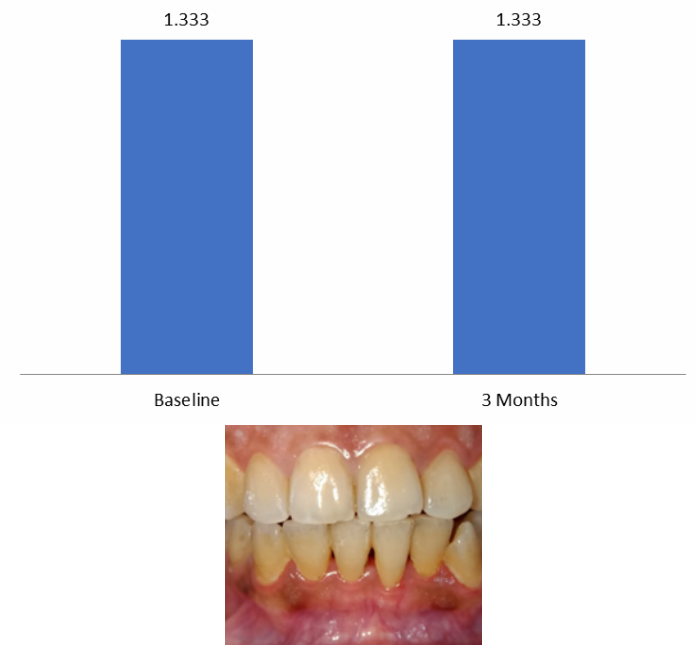

Fig.5 Post-op img at 3 month

IV. Discussion

As an antioxidant, vitamin C provides protection against oxidative stress-induced cellular damage by scavenging of reactive oxygen species, and it is used widely in beauty and cosmetic procedures.

In 1981 study by Murad et al[8]., titled "Regulation of collagen synthesis by ascorbic acid," established a paradigm-shifting understanding of Vitamin C, demonstrating that it acts as a primary stimulator of collagen production rather than just a passive cofactor for enzymatic reactions. By culturing human skin fibroblasts and exposing them to L-ascorbate over a prolonged period, the researchers observed a remarkable eight-fold increase in collagen synthesis with virtually no impact on the synthesis of non-collagenous proteins, proving the effect is highly specific to collagen genes. This stimulation was found to be independent of the well known role of Vitamin C as a cofactor for prolyl and lysyl hydroxylases, a conclusion drawn from the fact that even in the absence of ascorbate, cells produced collagen with normal hydroxylysine levels, yet the overall volume of collagen produced was significantly lower. The study further revealed a complex regulatory mechanism where ascorbate administration led to a three-fold increase in lysyl hydroxylase activity while simultaneously causing a significant decrease in prolyl hydroxylase activity, suggesting that collagen polypeptide synthesis and post-translational modifications are regulated by separate pathways. the mechanism likely operates at the transcriptional or translational level, as later confirmed by findings that Vitamin C specifically increases the steady-state levels of mRNA for Type I and Type III procollagen. This was a landmark discovery because it identified Vitamin C as a potent inducer of gene expression across different procollagen genes located on separate chromosomes, essentially acting as a signal for fibroblasts to accelerate the "machinery" of tissue repair and maintenance.

Mohammadtaghi Chitsazi et al[9]. in 2017 explored the synergistic antioxidant effects of melatonin and vitamin C as adjuncts to non-surgical treatment for chronic periodontitis. The researchers randomly assigned 60 subjects into three groups: one receiving only non-surgical periodontal treatment, another receiving treatment plus melatonin, and a third receiving treatment combined with both melatonin and vitamin C. While all groups showed improvement in clinical parameters like pocket depth (PD) and clinical attachment level (CAL) compared to baseline, a significant improvement in these scores was specifically noted at the 6-month mark for the group using the melatonin and vitamin C combination ($P < 0.05$). Ultimately, the study concluded that combining melatonin and vitamin C can enhance the results of non-surgical periodontal therapy, with vitamin C providing a beneficial additional effect when used in this combination.

Several types of microneedling devices has been developed within the period of 20- 30 years. Initially drum shaped rooller with studded with 192 needles used by dermatologists for acne scars. As new collagen fibers stimulated after the therapy it is also called collagen induction therapy. A newer alternative Derma pen is used now a days with mounted cartidge over it. The cartridge have round body with embedded 1-42 needles inside. These needles are fixed over a movable base. Now When dermapen starts the cartridge moves vertically and pears the skin. Deeper penetration needed for acne scars and scalp skin for hair rejuvenation.Lighter and shallow penetration is effective on face in hyperpigmented lesions like melasma and freckles. Various materials

used to make microneedles. These are made up of , silicon, metal or may be of ceramic. The needles may be solid which are commonly used for skin and hair rejuveantion or these may be hollow which are used for intra dermal drug delivery

G. Fabbrocini et al[10]. in 2011 conducted a study to evaluate whether skin needling could enhance the transdermal penetration of depigmenting serums, specifically rucinol and sophora-alpha, in the treatment of melasma. In this clinical trial involving twenty patients, a split-face methodology was utilized where one side of the face received a combined treatment of microneedling and depigmenting serum, while the contralateral side received the serum alone. Over a two-month observation period, the researchers utilized the Melasma Area Severity Index (MASI) score and the Spectrocolorimeter X-Rite 968 to measure outcomes. The results demonstrated that the side treated with the combination of skin needling and serum showed a statistically significant reduction in MASI scores and an improvement in luminosity index (L) levels compared to the side treated with topical serum alone. Furthermore, clinical symptoms were noted to be significantly improved on the needling side. The study concluded that microneedling is a potential and effective means to achieve better results in melasma treatment by facilitating the delivery of active depigmenting compounds into the skin.

In 2012 Soo Ick Cho et al[11]. evaluated the clinical efficacy of fractional radiofrequency microneedle (FRM) treatment for addressing acne scars and large facial pores. By enrolling 30 patients and delivering bipolar radiofrequency energy directly into the dermis, the researchers aimed to achieve selective heating while avoiding the epidermal damage often associated with traditional ablative lasers. The results showed significant clinical improvement, with the grade of acne scars and large pores improving in more than 70% of patients. While skin surface roughness and dermal density also showed positive changes, measures of sebum production and transepidermal water loss (TEWL) remained unaffected. The authors concluded that FRM is an effective, minimally invasive treatment that promotes dermal matrix regeneration, making it a viable option for improving skin texture and pore appearance

In our present study,locally delivered vitamin C along with microneedling have been used to promote their effect on incresed collagen synthesis synergystically. As studies have documented, that both vitamin C & microneedling can contribute to increased production of collagen,therefore these process has been applied to our study,to regain lost interdental papilla ,which are a primary esthetic concern for patients. However, the results of our study didn't yield any significant positive results in papillary reconstruction. The results of our study are in contradiction with Annapurna Ahuja et al. 2022[12],where significant positive results were observed.

Since, there are scarce studies that have utilized combination of vitamin C and microneedling in managing lost interdental papilla. So, further studies at a larger scale are required to assess the true potency of the combination for papillary reconstruction

V. Conclusion

The findings of the study show that the local adminstraion of vitamin C along with microneedling didn't have any significant impact on papillary reconstruction. Out of 15 patients only 2 responded with mild-moderate gain in interdental papillary height. Hence ,further studies with larger sample sizes are required to evaluate the therapeutic potential benefits of this approach.

References

[1]. Tarnow DP, Magner AW, Fletcher P. The Effect Of The Distance From The Contact Point To The Crest Of Bone On The Presence Or Absence Of The Interproximal Dental Papilla. J Periodontol. 1992 Dec;63(12):995-6.
[2]. Cunliffe J, Pretty I. Patients' Ranking Of Interdental "Black Triangles" Against Other Common Aesthetic Problems. Eur J Prosthodont Restor Dent. 2009 Dec;17(4):177-81.
[3]. Kurth JR, Kokich VG. Open Gingival Embrasures After Orthodontic Treatment In Adults: Prevalence And Etiology. Am J Orthod Dentofacial Orthop. 2001 Feb;120(2):116-23.
[4]. Pullar JM, Carr AC, Vissers MCM. The Roles Of Vitamin C In Skin Health. Nutrients. 2017 Aug 12;9(8):866Ko-Kimura N, Kimura-Hayashi M, Yamaguchi M, Ikeda T, Meguro D, Kanekawa M, Kasai K. Some Factors Associated With Open Gingival Embrasures Following Orthodontic Treatment. Australian Orthodontic Journal. 2003 Apr;19(1):19-24.
[5]. Du J, Cullen JJ, Buettner GR. Ascorbic Acid: Chemistry, Biology And The Treatment Of Cancer. Biochim Biophys Acta. 2012 Feb;1826(2):443-57.
[6]. Singh A, Yadav S. Microneedling: Advances And Widening Horizons. Indian Dermatol Online J. 2016 Jul-Aug;7(4):244-54.
[7]. Aust MC, Fernandes D, Kolokythas P, Kaplan HM, Vogt PM. Percutaneous Collagen Induction Therapy: An Alternative Treatment For Scars, Wrinkles, And Skin Laxity. Plast Reconstr Surg. 2008 Apr;121(4):1421-9Sauermann K, Jaspers S, Koop U, Wenck H. Topically Applied Vitamin C Increases The Density Of Dermal Papillae In Aged Human Skin. BMC Dermatol. 2004 Sep 2;4:13Van Der Geld P, Oosterveld P, Van Heck G, Kuijpers-Jagtman AM. Smile Attractiveness. The Angle Orthodontist. 2007 Sep 1;77(5):759-65.
[8]. Murad S, Grove D, Lindberg KA, Reynolds G, Sivarajah A, Pinnell SR. Regulation Of Collagen Synthesis By Ascorbic Acid. Proc Natl Acad Sci U S A. 1981 May;78(5):2879-82.
[9]. Chitsazi MT, Faramarzie M, Sadighi M, Shirmohammadi A, Hashemzadeh A. Effects Of Adjunctive Use Of Melatonin And Vitamin C In The Treatment Of Chronic Periodontitis: A Randomized Clinical Trial. J Dent Res Dent Clin Dent Prospects. 2017;11(4):236-40Tarnow DP, Magner AW, Fletcher P. The Effect Of The Distance From The Contact Point To The Crest Of Bone On The Presence Or Absence Of The Interproximal Dental Papilla. Journal Of Periodontology. 1992 Dec;63(12):995-6.

[10]. Fabbrocini G, Fardella N, Monfrecola A, Proietti I, Innocenzi D. Acne Scarring Treatment Using Skin Needling. Clinical And Experimental Dermatology. 2009 Dec 1;34(8):874-9.
[11]. Cho SI, Chung BY, Choi MG, Baek JH, Cho HJ, Park CW, Lee CH, Kim HO. Evaluation Of The Clinical Efficacy Of Fractional Radiofrequency Microneedle Treatment In Acne Scars And Large Facial Pores. Dermatol Surg. 2012 Jul;38(7 Pt 1):1017-24. Doi: 10.1111/J.1524-4725.2012.02402.
[12]. Ahuja A, Minz RS, Mishra A, Kumari S. Evaluation Of Regenerative Potential Of Locally Delivered Vitamin C Along With Microneedling In The Treatment Of Deficient Interdental Papilla: A Clinical Study. The Journal Of Contemporary Dental Practice. 2022 Aug 10;23(5):503-7