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Case Report

Gingival Thickness Augmentation Using Microneedling and Hyaluronic Acid: A Case Report with Preliminary Results

Zdravka Pashova-Tasseva [1], Viktoria Tyankova[1]

1 *Department of Periodontology, Faculty of dental medicine, 1 G. Sofiiski Str.,1431, Medical University, Sofia, Bulgaria*

Corresponding author: Zdravka Pashova-Tasseva, Sofia, Bulgaria; Email: z.pashova@fdm.mu-sofia.bg

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Abstract

Gingival phenotype plays a critical role in soft tissue stability, esthetics, and susceptibility to recession. While phenotype modification has traditionally relied on surgical approaches, there is growing interest in minimally invasive, non-surgical alternatives. This split-mouth clinical study evaluated gingival thickness modification using hyaluronic acid alone and hyaluronic acid combined with microneedling. In each patient, one site received hyaluronic acid application, while the contralateral site was treated with microneedling followed by hyaluronic acid, allowing direct intra-individual comparison. Both approaches resulted in increased gingival thickness; however, the combination of microneedling and hyaluronic acid demonstrated a more pronounced and consistent soft tissue thickening. These findings suggest that microneedling may enhance the biological effectiveness of hyaluronic acid by improving tissue responsiveness and penetration.

Keywords

gingival phenotype, gingival thickness, hyaluronic acid, microneedling

Introduction

The quality characteristics of gingival tissues are decisive for the long-term results of dental treatment and represent a serious factor influencing its predictable outcome. The periodontal phenotype is considered a major factor that is relevant to the planning and performance of restorative, surgical, prosthetic, orthodontic or periodontal treatment (1). The gingival phenotype is a term that includes the gingival thickness and width of the keratinized gingiva, and together with the bone morphotype (thickness of the buccal bone plate) are involved in the description of the term periodontal phenotype (2). Various clinical protocols are applied in the modification of the gingival phenotype. Procedures with soft tissue grafts are considered the gold standard in terms of attachedized and keratinized tissue gain, but are associated with the preparation of two surgical beds – recipient and donor. In search of non-surgical approaches to improve the gingival phenotype, various protocols are currently available, including the use of hyaluronic acid.

Thin gingival tissue poses risks to the patient's treatment, especially in combination with insufficient width of the keratinized gingiva is considered a risk factor

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for gingival recessions and complications concerning soft tissues (3). The thickness of the gingival tissue is thought to be of greater clinical importance compared to the width of the keratinized gingiva, especially with regard to the development of gingival recessions after orthodontic treatment (3). To improve the quality of gingival tissues, many methods are offered, most of which are surgical (4). The desire for the development of new, non-surgical methods for modification of gingival tissues leads to the development of methods whose application is not associated with surgical interventions. At present, two main methodologies – application of i-PRF and application of HA. Since the two substances share similar biological effects, comparative studies between them are often analyzed in the scientific literature.

Gingival phenotype modification therapies effectively increase gingival thickness and improve soft tissue stability around natural teeth. Among the available approaches, connective tissue grafts provide the most predictable and substantial thickening, while less invasive techniques and biomaterial-based alternatives demonstrate more variable but clinically relevant outcomes. Overall, converting a thin gingival phenotype into a thicker one enhances resistance to gingival recession and mechanical trauma, underscoring the importance of phenotype modification in periodontal and restorative treatment planning (5).

Materials and methods

Case presentation

A 29-year-old female patient in good general health and with no history of smoking attended the clinic reporting esthetic dissatisfaction related to exposed root surfaces, as well as brushing-associated discomfort and pain, most pronounced in the mandibular anterior region. A comprehensive periodontal evaluation was carried out, including clinical and radiographic assessment. Oral hygiene levels and gingival inflammatory status were quantified using the Full Mouth Plaque Score (FMPS) and Full Mouth Bleeding Score (FMBS). The findings were consistent with plaque-induced gingivitis, accompanied by gingival recessions and a thin gingival phenotype (Figure 1). In view of the planned periodontal intervention, an evaluation of periodontal tissue quality was performed.

Gingival thickness was initially estimated clinically using the TRAN method, based on the translucency of the periodontal probe through the marginal gingiva after sulcular insertion. To enhance measurement reliability, the clinical assessment was corroborated by direct measurements obtained with a digital calliper following insertion of a size 20 endodontic file into the gingival tissue (Figure 2). The patient met all predefined inclusion criteria (adult individual; periodontal health; thin scalloped gingival phenotype in the mandibular anterior region; non-smoker; gingival thickness < 1 mm). Prior to treatment, detailed information regarding the nature, objectives, and sequence of the procedures was provided, and written informed consent was obtained.

Following completion of step 1 periodontal treatment, professional periodontal care was continued until adequate plaque control was achieved and clinical signs of gingival inflammation were markedly reduced. Despite documented improvement in oral hygiene performance, the patient continued to report discomfort during toothbrushing, and bleeding on brushing persisted in the area of interest. Prior to the planned intervention, topical anesthesia was administered using lidocaine spray to ensure patient comfort. Hyaluronic acid (Hyadent BG) was applied in three separate sessions, scheduled at 10-day intervals. The injections were delivered apical to the keratinized gingiva using a 30-gauge needle with a penetration depth of 4 mm. A split-area approach was adopted: one part of the region of interest received hyaluronic acid alone, whereas the contralateral part was treated with microneedling followed by hyaluronic acid application. After material placement, gentle manual compression was applied to ensure uniform distribution within the soft tissues. (Figures 3-5).

Figure 1. Initial status

Figure 2. Gingival thickness evaluation.

Figure 3. Microneedling performed prior Hyadent® BG injection

Figure 4. Injection of Hyadent® BG.

Figure 5. Clinical appearance after Hyadent® BG application.

Results

The re-evaluation of the gingival thickness was performed on the first, third and sixth month after the third procedure. The measurements in the treated area were performed under topical anaesthesia with Lidocaine spray, and the data was obtained with digital calliper. The results are summarised in a Table 1. Gingival thickness increased markedly at all treated sites one month after the procedure and remained stable through the third and sixth months. These findings indicate a sustained and clinically relevant augmentation of gingival thickness over a six-month follow-up period.

Table 1. Results after re-evaluation.

	#43	**#42**	**#41**	**#31**	**#32**	**#33**
Initial measurements of GT	**0.47**	**0.72**	**0.53**	**0.52**	**0.60**	**0.57**
1 month	0.87	1.02	0.72	0.69	0.81	0.82
3 month	0.89	1.00	0.73	0.69	0.80	0.84
6 month	0.94	1.01	0.72	0.70	0.81	0.82

Discussion

Accurate identification and understanding of the periodontal phenotype are essential, as phenotype diagnosis directly influences risk assessment, treatment planning, and the predictability of both surgical and minimally invasive soft tissue interventions(6). Long-term clinical evidence indicates that soft tissue phenotype modification is a key determinant of gingival margin stability and has traditionally been achieved through surgical techniques, such as connective tissue grafting, which remain the gold standard for ensuring durable soft tissue outcomes; however, this has prompted growing interest in less invasive, biologically driven approaches capable of inducing comparable phenotype-related benefits (7,8). Given the clinical relevance of accurate periodontal phenotype assessment, there is an increasing need for minimally invasive, non-surgical approaches capable of improving gingival phenotype and soft tissue dimensions.

Hyaluronic acid has emerged as a biologically active adjunct in the management of gingival recession, demonstrating beneficial effects on soft tissue healing, gingival thickness, and clinical attachment stability. Its anti-inflammatory, hygroscopic, and regenerative properties support improved tissue maturation and volumetric stability, either as a stand-alone minimally invasive approach or as an adjunct to conventional periodontal therapies. These findings reinforce the role of hyaluronic acid in soft tissue phenotype enhancement and recession management, particularly in cases where surgical interventions may be contraindicated or undesirable (6,7). Hyaluronic acid and polynucleotides have been applied as biologically active adjuncts in combination with volume-stable collagen matrices for the coverage of multiple gingival recessions. This approach aims to enhance soft tissue healing, improve tissue quality, and support volumetric stability of the grafted area, while reducing surgical morbidity. The combined use of these biomolecules highlights their role in optimizing soft tissue outcomes and expanding regenerative strategies in periodontal plastic surgery (8). Beyond its application as adjunctin gingival recession management, hyaluronic acid is increasingly recognized as a biologically active mediator in regenerative and reconstructive periodontal therapy. By modulating inflammation, enhancing angiogenesis, and supporting extracellular matrix organization, hyaluronic acid contributes to improved soft tissue quality and wound healing, positioning it as a versatile adjunct in phenotype modification and minimally invasive periodontal regeneration (9). Hyaluronic acid has been applied as an injectable biomaterial for the reconstruction of lost interdental papillae and the management of black triangle defects in the anterior region. Its volumizing capacity, biocompatibility, and ability to support soft tissue hydration and stability allow for minimally invasive improvement of interdental soft tissue contours and esthetic outcomes (10,11).

In line with the expanding role of hyaluronic acid in periodontal soft tissue regeneration, clinical comparisons with other biologically active injectables further support its relevance in gingival phenotype modification. Evidence comparing hyaluronic acid with injectable platelet-rich fibrin indicates that both approaches effectively increase gingival thickness in thin phenotypes, with hyaluronic acid offering consistent improvements through a minimally invasive and biologically favorable modality (12). Evidence regarding gingival thickness modification using hyaluronic acid remains limited, with relatively few studies directly addressing its capacity to induce stable soft tissue thickening. Experimental data indicate that microneedling enhances the biological activity of hyaluronic acid by improving its tissue penetration, stimulating local angiogenesis, and activating wound-healing pathways, thereby promoting periodontal soft tissue regeneration. These findings suggest that microneedling-assisted delivery may potentiate the regenerative effects of hyaluronic acid and represent a promising minimally invasive strategy for gingival phenotype modification, warranting further clinical investigation which is in alignment with our results (13). Alongside hyaluronic acid–based approaches, microneedling has also been investigated in combination with injectable platelet-rich fibrin for gingival augmentation in patients with a thin gingival phenotype. Clinical evidence indicates that microneedling enhances soft tissue thickening both as a stand-alone stimulus and as a delivery-facilitating technique for biologically active injectables such as i-PRF, resulting in measurable improvements in gingival volume and quality (14–16). Collectively, these findings support microneedling as a versatile, minimally invasive modality for gingival phenotype modification, capable of potentiating different regenerative agents and reinforcing its clinical relevance in soft tissue augmentation strategies (17).

Consistent with clinical comparisons showing that hyaluronic acid can effectively improve soft tissue dimensions in patients with a thin gingival phenotype, our findings further demonstrate a measurable increase in gingival thickness following hyaluronic acid application. In line with the reported efficacy of hyaluronic acid as a minimally invasive alternative to injectable platelet-rich fibrin, the observed gingival thickening in our study supports its role as a biologically active agent capable of inducing clinically relevant phenotype modification (12). Together, these data reinforce the potential of hyaluronic acid–based approaches for soft tissue augmentation, particularly when combined with techniques that enhance tissue responsiveness. Similar principles of phenotype modification have been successfully applied to peri-implant sites, where microneedling with or without injectable hyaluronic acid has been shown to increase soft tissue thickness and improve tissue quality. These findings support the broader applicability of hyaluronic acid–based, minimally invasive approaches for soft tissue augmentation beyond natural teeth (18). Given the limited number of studies addressing gingival phenotype modification using hyaluronic acid, particularly in combination with minimally invasive techniques such as microneedling, the present findings are of notable clinical relevance. The demonstrated increase in gingival thickness highlights the importance of this approach and underscores the need for further well-designed clinical studies to validate its effectiveness and establish standardized treatment protocols.

Conclusion

Contemporary clinical dentistry increasingly prioritizes minimally invasive, patient-centered strategies guided by individualized diagnostic assessment. Careful evaluation of gingival tissue characteristics is essential for selecting conservative treatment approaches aimed at improving soft tissue quality and long-term stability. Within this framework, non-surgical methods for gingival phenotype modification have gained growing interest as alternatives to conventional surgical interventions. In the present clinical case, the combined application of microneedling and hyaluronic acid was associated with a clinically evident increase in gingival thickness, suggesting a synergistic effect on soft tissue response. These preliminary observations indicate that the proposed protocol may represent a conservative option for gingival tissue thickening around natural teeth. However, further well-designed clinical studies with larger cohorts and extended follow-up periods are required to confirm these findings and establish their statistical significance.

Additional information

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Ethical compliance

Ethical approval was obtained prior to treatment, and all procedures were conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from the patient.

Conflict of interest

The authors declare that they have no conflict of interest and no affiliations with or involvement in any organization or entity with any financial interest in the subject matter or materials discussed in this manuscript.

Author contributions

Conceptualization: ZIPT, VT. Data curation: ZIPT. Formal analysis: ZIPT. Funding acquisition: ZIPT. Investigation: VT, ZIPT. Methodology: ZIPT. Project administration: ZIPT. Resources:

ZIPT, VT. Supervision: ZIPT. Visualization: VT, ZIPT. Writing - original draft: ZIPT. Writing - review and editing: ZIPT.

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