Advancing Aesthetic Medicine: Efficacy and Safety of the Intraoral Hyaluronic Acid Injection Technique for Nasolabial Fold Correction

Jong-Jin Lee, M.D

Department of Dentistry
The Graduate School, Yonsei University

Advancing Aesthetic Medicine: Efficacy and Safety of the Intraoral Hyaluronic Acid Injection Technique for Nasolabial Fold Correction

Directed by Professor Hee-Jin Kim, D.D.S., Ph.D.

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Jong-Jin Lee, M.D

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This certifies that the Doctoral Dissertation
of Jong-Jin Lee is approved.

_____
Thesis Supervisor: [Hee-Jin Kim]

_____
[Kyung-Seok Hu: Thesis Committee Member #1]

_____
[Han-Sung Jung: Thesis Committee Member #2]

_____
[Young-Chun Gil: Thesis Committee Member #3]

_____
[You-Jin Choi: Thesis Committee Member #4]

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The Graduate School
Yonsei University
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학위 논문을 쓰기 시작하니 가장 먼저 2019 년, 해부학에 대한 지적인 욕망이 동하여 무작정 박사학위를 따고 싶다고 김희진 교수님께 이메일을 보냈던 때가 생각이 났습니다. 그 때의 저는 의사 면허를 취득한 지 2 년차밖에 되지 않은 신참 의사에 불과하였고, 심지어 공중보건의라는 신분으로 사실은 대학원에 입학하여 학업과 연구를 수행할 충분한 자격이 되지 않았을 것으로 생각합니다. 그럼에도 불구하고 저를 환대하며 이 길로 처음 이끌어 주시고, 여전히 늘 저를 더 나은 길로 인도해주시는 김희진 교수님께 진심으로 존경과 감사를 표하면서 시작하고 싶습니다.

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마지막으로, 늘 제 옆에서 지지하고 응원해주는 영원한 제 편, 저의 아내 주연이에게 사랑과 감사의 인사를 전합니다.

2024 년 7 월

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Advancing Aesthetic Medicine: Efficacy and Safety of the Intraoral Hyaluronic Acid Injection Technique for Nasolabial Fold Correction

Jong-Jin Lee, M.D.

Department of Dentistry
The Graduate School, Yonsei University

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The aesthetic correction of nasolabial folds (NLFs) represents a significant advancement in the field of dermatological aesthetics, particularly given the aging population's growing interest in minimally invasive cosmetic enhancements. This study focuses on the intraoral injection technique using hyaluronic acid (HA) fillers, a novel approach that offers distinct advantages over traditional percutaneous injection method in terms of safety and effectiveness.

HA fillers, renowned for their biocompatibility, reversible effects, and immediate aesthetic improvement, are the fillers of choice due to their ability to integrate smoothly into the tissue and mimic the natural hyaluronic acid in the skin. The intraoral route, by avoiding significant facial blood vessels encountered during external injections, significantly reduces the risks of vascular occlusions and other serious complications such

as skin necrosis and blindness. The technique's safety profile is further enhanced by the precision afforded by the control over depth and placement of the filler, made possible through the detailed anatomical knowledge of facial planes and vasculatures.

The study evaluated the efficacy and safety of this approach through cadaveric experiment, clinical outcomes, and patient satisfaction. The findings indicated a noticeable improvement in the severity of the NLFs, with patients moving from a Grade 4 to a Grade 3 on the Wrinkle Severity Rating Scale, highlighting the effectiveness of the intraoral injection in improving NLF and restoring a youthful appearance. Additionally, the feedback from patients was overwhelmingly positive, with a high level of satisfaction noted in terms of both the aesthetic results and the minimal discomfort experienced during the procedure.

This paper presents the clinical application of this innovative technique, discusses its implications for the future of cosmetic procedures, and advocates for its broader adoption as a safer, more effective alternative to traditional injection methods. By integrating comprehensive anatomical knowledge into the injection process, this approach promises to transform the landscape of facial aesthetic procedures, potentially establishing a new standard of care that prioritizes patient safety and comport without compromising on cosmetic outcomes.

Keywords: Hyaluronic acid filler, Minimally invasive procedure, Nasolabial fold, Filler injection, Intraoral injection

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I. Introduction

The minimally invasive procedures have been popularized as the preference for aesthetic procedure with minimal downtime increases. In 2020, the number of minimally invasive

procedures rose by 174% compared to 2000, with soft tissue filler injections making up 26% of the total cases (Statistics, P.S.P., 2021). While soft tissue filler injections are becoming increasingly popular, they are also associated with a growing number of reported complications. Among the most severe adverse effects are skin necrosis, blindness, and death. (Levi et al., 2012; Beleznay et al., 2015). The most effective strategy for mitigating these serious complications is a thorough understanding of the anatomical background.

Facial aging and nasolabial folds

Facial aging is a multifaceted process influenced by genetic, environmental, and lifestyle factors, manifesting through changes in skin elasticity, volume loss, bony absorption, and the deepening of wrinkles. Nasolabial folds (NLFs), prominently running from the sides of the nose down to the corners of the mouth, are among the most visible signs of aging. Their appearance is primarily due to the gravitational descent of facial soft tissues and the atrophy of midfacial fat. Given their significant impact on perceived age, the effective management of NLFs is a critical focus in aesthetic treatments. (Stefura et al., 2021)

Hyaluronic acid fillers: a revolution in non-surgical facial rejuvenation

Hyaluronic acid (HA) fillers have revolutionized the approach to non-surgical facial rejuvenation due to their ability to effectively restore volume and diminish the signs of aging with minimal downtime. As a naturally occurring polysaccharide found in the skin, HA plays a crucial role in maintaining skin hydration and youthfulness. (Kim et al., 2011) Over time, the natural degradation of HA contributes to the aging of skin and the formation of wrinkles. Synthetic HA fillers are engineered to mimic the hydrating and volumizing effects of natural HA, providing temporary but substantial improvement in skin contour and youthfulness. (Beasley et al., 2009)

Innovative intraoral injection technique

The intraoral injection technique for HA filler administration represents a significant advancement in the safety profile of facial aesthetic procedures. Traditional percutaneous injection methods, while effective, pose risks such as vascular occlusion and consequent serious complications like skin necrosis or, rarely, blindness due to accidental intravascular filler injection. The intraoral approach mitigates these risks by accessing the NLFs internally, bypassing major facial blood vessels encountered during external injections. (Sobel et al., 2009; Anand et al., 2010) This method leverages detailed anatomical knowledge of facial planes and vasculature to enhance the precision of filler placement, thereby improving safety outcomes.

Discussion on Product Selection and Clinical Applications

Choosing the right type of HA filler is paramount to achieving desired aesthetic outcomes and depends on various factors including the rheological properties of the fillers and the specific facial areas being treated. Products with higher levels of HA concentration and cross-linking are generally used for deeper tissue support and volumization, such as in the cheeks or nasolabial folds, whereas softer, less cross-linked products are suited for more superficial placement and fine line correction. (Gutowski et al., 2016) The comprehensive understanding of these products, combined with a thorough patient assessment, allows clinicians to tailor treatments to individual aging patterns and facial structures, maximizing the rejuvenative effects while maintaining natural facial dynamics.

Purpose of This Study

The correction of nasolabial folds using fillers has been extensively performed with conventional techniques. However, the most severe complications associated with these procedures include skin necrosis and blindness. These adverse events, although rare, have been reported with the traditional methods. The primary cause of these complications lies in the conventional percutaneous injection method, which involves penetrating the skin layers, traversing the facial artery, and finally reaching the target supraperiosteal layer. This method inevitably risks impacting the facial artery, leading to intra-arterial occlusion or extra-arterial compression, which are the main causes of the aforementioned severe complications.

In contrast, the novel intraoral injection method begins from within the oral cavity, directly accessing the deepest layer of the skin—the supraperiosteal layer. By gliding along the maxilla bone while maintaining the trajectory within this layer, the technique avoids any contact with the facial artery. This theoretical advantage suggests a significant reduction in the risk of major complications associated with the facial artery.

This study aims to evaluate whether the intraoral injection method accurately reaches the intended supraperiosteal layer through cadaveric studies. Furthermore, it investigates the clinical outcomes when applied to actual patients, comparing the efficacy, safety, and patient comfort between the intraoral method and the conventional percutaneous method.

This includes an assessment of any differences in pain and discomfort experienced during the procedures.

II. Materials and Methods

Subjects

A volunteer and a cadaver were enrolled to perform the intraoral HA filler injection and to comparison with the conventional percutaneous injection technique. This study was conducted with the full informed consent of the patient and in compliance with the guidelines of the Declaration of Helsinki.

Before injection procedure, volunteer provided a signed written consent form. The study participant was thoroughly informed about all potential side effects and had the option to withdraw from the study at their discretion. Participant who was 64 year-old female was not pregnant, didn′t have a history of drug allergies, or any severe medical conditions.

A volunteer and a cadaver got conventional percutaneous injection on their left side of face and novel intraoral injection on their right side to compare the results between the methods.

Hyaluronic acid fillers

This study primarily employed "Lorient no. 6" (Joonghun Pharmaceutical Co., Ltd.), a hyaluronic acid filler which contains 20 mg/mL of cross-linked hyaluronic acid combined with 0.3% lidocaine hydrochloride monohydrate. This product is carefully formulated to ensure minimal inflammatory response, with strict controls to limit BDDE and endotoxin residues to undetectable levels using standard instrumentation, affirming its safety for clinical use. The osmolarity of this filler is optimized to 300 mOsm/kg, closely mirroring that of human blood, thereby minimizing foreign body sensation and enhancing patient comfort during and post-treatment.

Conventional percutaneous injection method

A 23G needle was used to create a puncture site 1 cm lateral and 1 cm inferior to the oral commissure. Through this entry point, a 23G blunt cannula was inserted and advanced deeply into the supraperiosteal layer. The cannula was carefully glided along the surface of the bone to reach Ristow's space. Subsequently, approximately 0.4 cc of HA filler was cautiously injected using the retrograde linear thread technique. (Figure 1, (A)) In this study, the conventional method was applied to the patient's left nasolabial fold and cadaver′s left nasolabial fold.

Intraoral injection technique

To mitigate infection risks, oral hygiene was maintained with a chlorhexidine gargle and betadine dressing prior to the procedure. An initial puncture was made using a 23g needle at the upper gingival fornix, specifically at the junction between the lateral incisor and the canine. A blunt 23G cannula was then inserted through this entry point and carefully advanced toward Ristow′s space, staying superficial to the periosteal layer by gliding along the surface of the bone. (Figure 1B, Figure 2) This technique ensures that the cannula tip does not penetrate more superficial anatomical layers containing important anatomical structures, significantly reducing the risk of encountering major blood vessels. Each side of the nasolabial fold was treated with a controlled retrograde injection of about 0.4cc of HA filler, optimizing the volumetric enhancement while ensuring procedural safety. In this study, the intraoral method was applied to the patient's right nasolabial fold and cadaver′s right nasolabial fold.

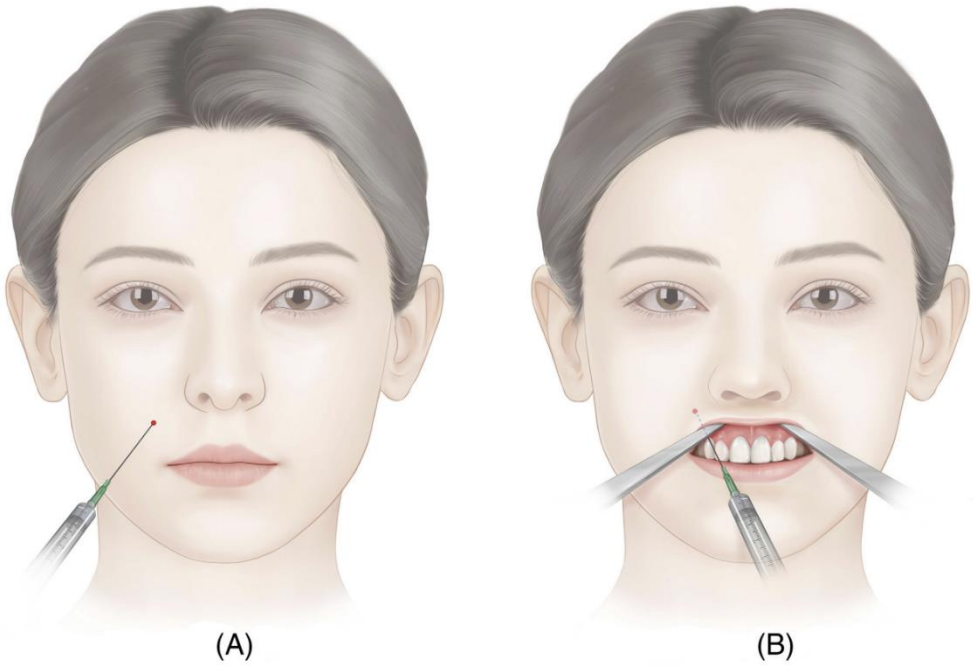

Figure 1. Comparison of the conventional percutaneous HA filler injection method for nasolabial fold (A) and the intraoral injection method (B).

Figure 2. Intraoral injection technique

Anatomical considerations

The procedure's safety is heavily reliant on the detailed knowledge of the facial artery's course, which is critical for avoiding vascular complications. The artery's pathway along the nasolabial fold is noted for its superficial position relative to the periosteal layer, allowing safer injections. This anatomical insight is crucial for planning the injection trajectory, ensuring that the filler is deposited without risking vascular occlusion or more severe complications like tissue necrosis and blindness. Since the facial artery runs superficial to the periosteal layer, it can be injected relatively safely by touching the bone with a cannula and then injecting the filler into the Ristow's space. (Figure 3, Figure 4)

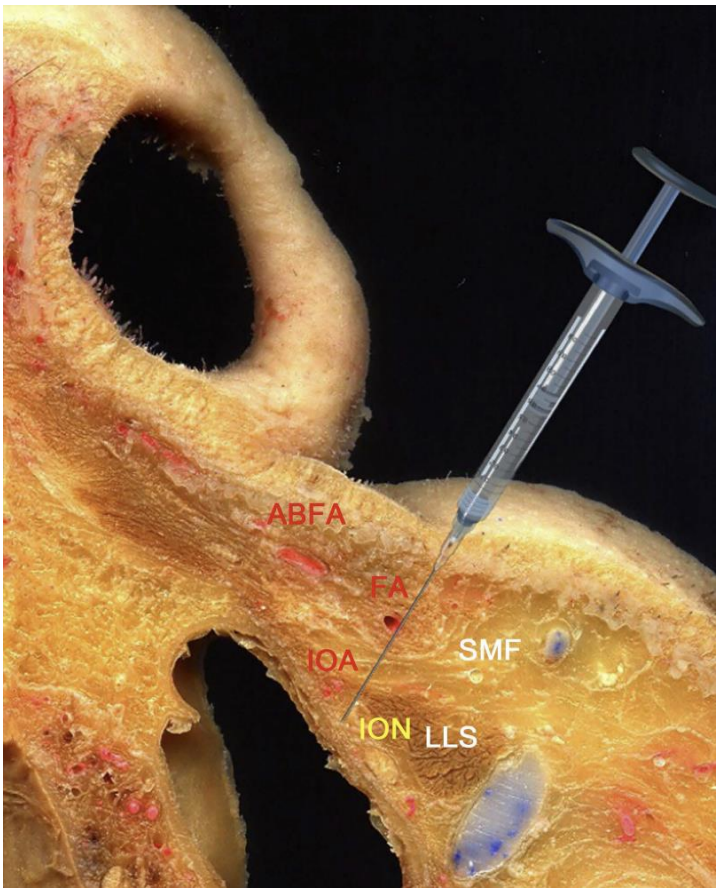

Figure 3. Anatomical structures that should be considered in the nasolabial fold filler injection. ABFA, alar branch of the facial artery; FA, facial artery; IOA, infraorbital artery; ION, infraorbital nerve; LLS, levator labii superioris; SMF, superficial medial cheek fat.

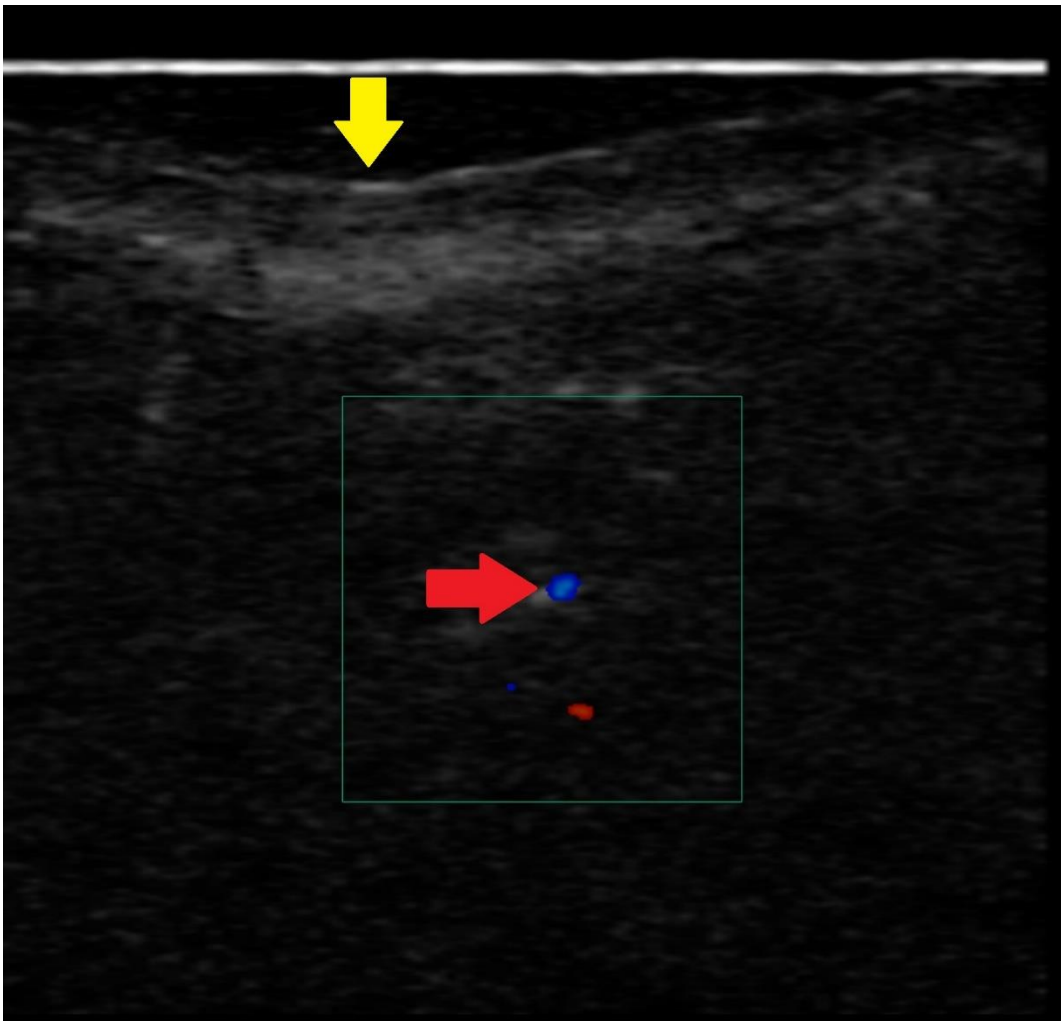

Figure 4. Ultrasonographic imaging related to nasolabial fold filler injection.

Transverse view at alar level. Yellow arrow: nasolabial fold; Red arrow: facial artery.

Patient selection criteria

The participant was chosen based on their Wrinkle Severity Rating Scale (WSRS) score, with grade 4 indicating severe nasolabial folds. (Figure 5) This grade was selected because it represents that the patient would benefit most from volumization. This grading also facilitates standardized before and after comparisons to assess the efficacy of the filler treatment.

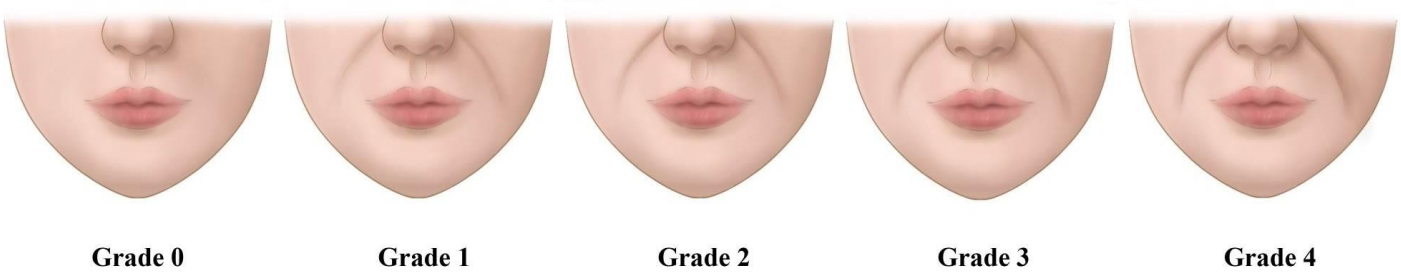

Figure 5. Wrinkle Severity Rating Scale: The severity of nasolabial folds is classified into five grades, ranging from grade 0 to grade 4, based on depth, length, and overall prominence.

Safety measures and pain management

Preventative measures against infection included chlorhexidine gargling and betadine dressing prior to the procedure and post-procedure antibiotic prescriptions for a duration of three days. Pain management during the procedure included infraorbital nerve block and did not include mucosal surface anesthesia. Medication for pain management such as NSAIDs is optional.

Evaluation of outcomes

0Effectiveness of the filler injection was assessed immediately post-procedure using the same WSRS used for initial evaluation. This method provides a consistent metric for measuring aesthetic improvements and patient satisfaction. Initial and post-procedural pictures was also recorded and evaluated by "Vectra M3" (Canfield Scientific, Inc, Fairfield, NJ, USA), a 3D imaging system. The ultrasound images were captured using a "Sonofinder", a ultrasound device (SONOFINDER Co., Ltd., Seongnam, Gyeonggi, South Korea).

III. Results

Effectiveness of Nasolabial Fold Correction Using the Intraoral Injection Method

To validate the effectiveness of filler injections for nasolabial fold correction using the intraoral injection method, 0.4 cc of HA filler was administered into the Ristow's space of the left side of the participant's face. The analysis was conducted using the Vectra M3 3D Scanner, which provides a color heatmap to visualize volume changes before and after the procedure. The results showed an augmentation of approximately 0.85 mm in the injected area on the left nasolabial fold of the face post-procedure (Figure 6, red arrow). As expected, no augmentation was observed on the untreated right nasolabial fold area, where no filler was injected.

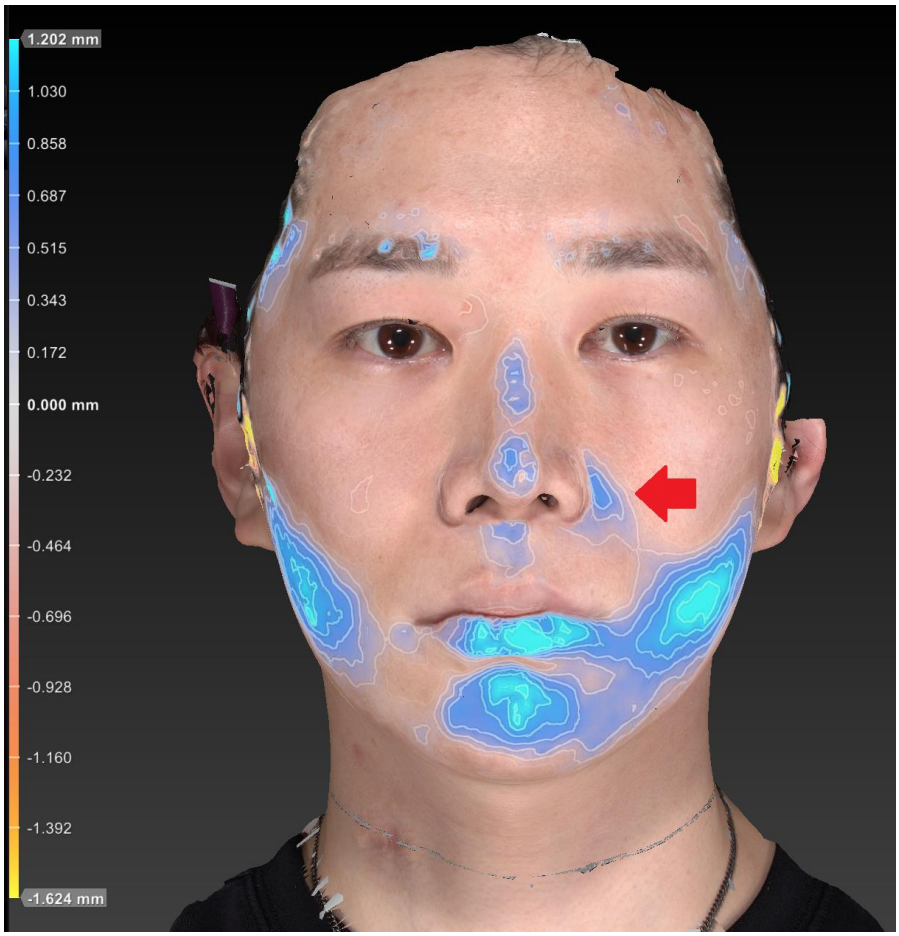

Figure 6. Color Heatmap Analysis of Volume Change Pre- and Post-Procedure: A color heatmap analysis was conducted to assess the volume change before and after the procedure. Filler was injected into the nasolabial fold area on the left side of the participant's face using the intraoral method (indicated by the red arrow). The blue color in the treated area indicates an augmentation of approximately 0.85 mm. It should be noted that the blue color observed in other areas is due to additional filler injections requested by the participant in those regions.

Comparative effectiveness of the intraoral injection method for nasolabial folds versus the conventional percutaneous method

This study investigated the aesthetic improvements provided by hyaluronic acid fillers and comparative effectiveness of intraoral injection method, focusing on nasolabial fold correction. A patient initially presented with Grade 4 severity on the WSRS (Figure7, Left). In this study, the conventional percutaneous injection method was applied to the left side of the patient's nasolabial fold, while the intraoral injection method was applied to the right side. Following treatment, the patient experienced an improvement to Grade 3 (Figure 7, Right), indicating a noticeable reduction in the depth of the nasolabial folds on both sides. This significant visual improvement was well-documented through before-and-after photographs (Figure 7), which clearly displayed the softening of the nasolabial folds. The patient expressed 'very satisfied' feedback regarding the outcomes on both sides, highlighting that the effectiveness of the intraoral injection method is comparable to the conventional percutaneous injection method in enhancing facial aesthetics with natural-looking results.

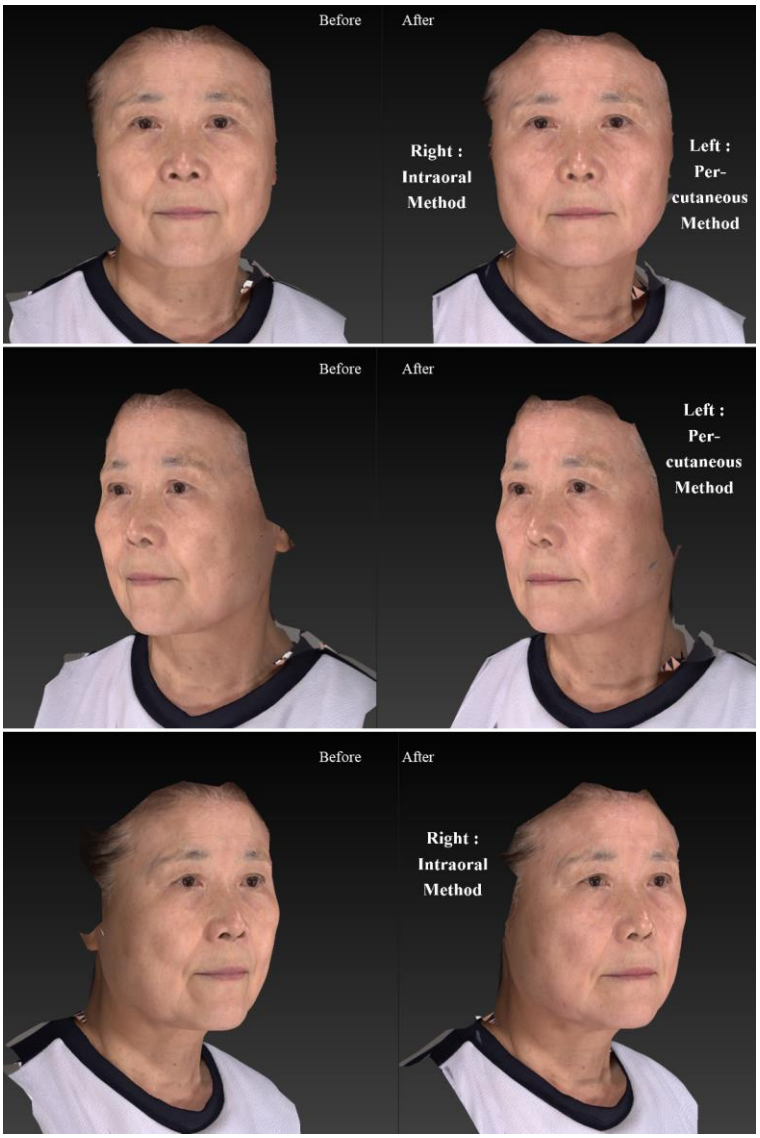

Figure 7. Before-and-after 3D photographs of the patient: Left sides of this figure are before-treatment photos; right sides are after-treatment photos; Patient′s left side is treated by the conventional percutaneous injection method; Patient′s right side is treated by the novel intraoral injection method.

Safety evaluation

The safety of the intraoral injection technique was a primary focus of this study. Notably, patient experienced only mild discomfort during intraoral injection procedure, with no serious adverse effects reported. When applying the intraoral approach, the method involves gliding along the surface of the maxilla bone to reach the target location. This technique contrasts with the percutaneous approach, which must navigate through the facial artery located at approximately 0.5 cm depth from the epidermis, at a mid-level between the epidermis and the surface of the maxilla bone. The intraoral approach circumvents the facial artery, which resides in the supraperiosteal layer, ensuring that there is no direct encounter with this vessel. Consequently, the intraoral approach significantly reduces the risk of damaging the facial artery, making it a considerably safer alternative compared to the conventional percutaneous method. The use of a blunt cannula further minimized the risk of penetrating significant blood vessels, thereby avoiding potential complications such as bruising, hematoma, vascular occlusion, or tissue necrosis. This safety-focused approach underscores the procedure's high safety profile when conducted under detailed anatomical guidance.

Patient Satisfaction and Comfort

Patient′s comfort and satisfaction were assessed through post-treatment survey. Despite experiencing mild discomfort during procedure, which is typical for most dermal filler procedures, patient reported no lasting pain and discomfort or significant adverse reactions. The minimal invasiveness of the intraoral route, coupled with the effective infraorbital nerve block, contributed to the positive treatment experience. This satisfaction is particularly significant given the conservative approach and the meticulous execution of the injection technique.

Comparison of injection planes between conventional and intraoral injection methods in cadaver

In this study, dyed hyaluronic acid fillers were utilized to compare the injection sites achieved by two different methods. The conventional percutaneous injection method was applied to the left side of a cadaver's face, while the intraoral injection method was used on the right side. Following the injections, dissections were performed to verify the location of the dyed hyaluronic acid filler on each side. The results indicated that both methods successfully deposited the filler in the ideal injection plane, the supraperiosteal layer(Figure 8).

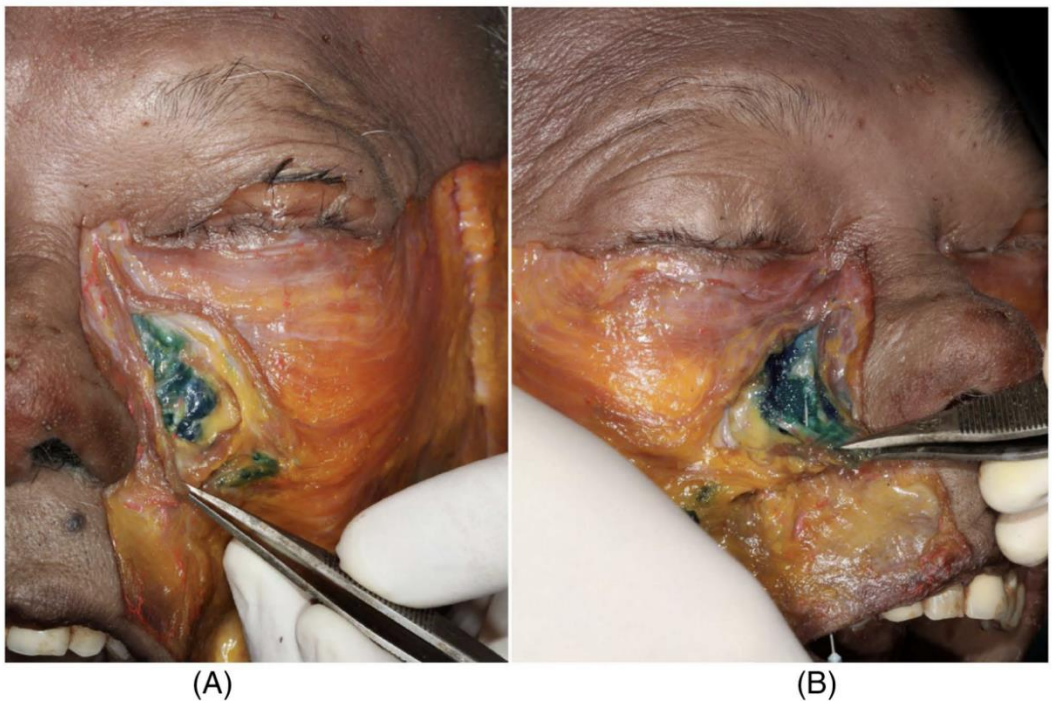

Figure 8. Comparison of injection planes between two methods in cadaver. (A) Conventional percutaneous injection method; (B) Intraoral injection method; Both methods have the same injection plane, the supraperiosteal layer. In both cases, the fillers are injected slightly above the nasolabial fold.

IV. Discussions

Interpretation of results

The significant improvement from Grade 4 to Grade 3 on the WSRS for both sides of nasolabial fold treated with hyaluronic acid fillers represents a noteworthy clinical achievement. This change indicates not only a reduction in the depth of nasolabial folds but also an enhancement in overall facial aesthetics, which was highly valued by the patients. The feedback of "very satisfied" from participant underscores the effectiveness of the treatment in achieving natural-looking results with minimal invasiveness.

This study highlights the comparison between two injection methods applied to different sides of the patient's face: the conventional percutaneous injection method on the left side and the intraoral injection method on the right side. Notably, the patient expressed equal satisfaction with the results on both sides. This implies that the intraoral injection method can achieve results comparable to the conventional method.

Furthermore, the study involved a cadaver analysis to verify the injection planes of both methods. The findings demonstrated that both techniques successfully delivered the hyaluronic acid filler to the supraperiosteal layer, which is considered the safest and most ideal injection plane for nasolabial fold correction (Salti et al., 2015).

In summary, both injection methods are effective in achieving highly satisfactory results for patients, and both methods accurately reach the ideal injection plane.

Safety considerations based on anatomical background

Injecting fillers for nasolabial fold correction requires meticulous attention to safety due to the potential for severe complications such as skin necrosis or blindness if the anatomical background is not thoroughly understood (Beleznay et al., 2015). The most critical anatomical structure to consider is the topography of the facial artery. Previous studies have shown that the facial artery is located medial to the nasolabial fold (NLF) in 42.9% of cases, lateral to the NLF in 23.2% of cases, and crossing the NLF in 33.9% of cases. Consequently, it must be assumed that the facial artery is always present around the nasolabial fold. (Figure 9)

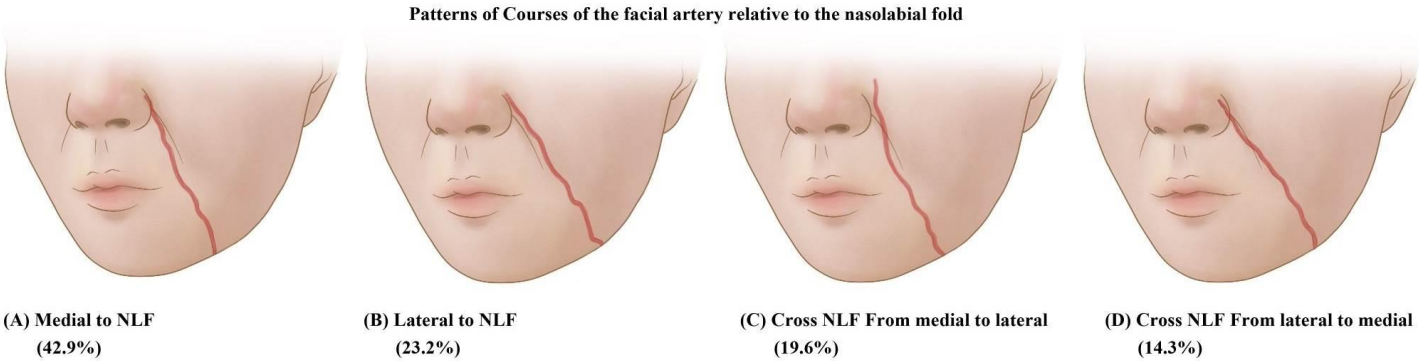

Figure 9. Patterns of courses of the facial artery(FA) relative to the nasolabial fold(NLF).

(A) FA is located medical to the NLF in 42.9% of cases, (B) lateral to the NLF in 23.2% of cases, (C) crossing the NLF from medial to lateral in 19.6% of cases, (D) lateral to medical in 14.3% of cases.

Therefore, when performing hyaluronic acid filler injections for nasolabial fold correction, it is inevitable to encounter the facial artery. To mitigate the risk of severe complications under such circumstances, the only viable approach is to avoid the plane where the facial artery resides, based on a thorough anatomical understanding of its depth. Previous studies have shown that, in the Ristow's space area, the facial artery is located approximately 1.5 mm deep from the skin surface, positioned between the levator labii superioris alaeque nasi muscle and the levator labii superioris. In other words, it is situated midway between the surface of the skin and the surface of the maxilla bone (Figure 4). Consequently, the safest and most ideal plane for nasolabial fold augmentation using fillers is considered to be the deepest plane, the supraperiosteal plane and filler materials should be injected in this plane.

Clinical Implications of Intraoral Injection Techniques

The intraoral injection technique offers substantial clinical benefits, particularly in reducing the risks associated with traditional percutaneous injection methods. A critical aspect of this technique is the comprehensive anatomical review of the facial artery, which plays a crucial role in ensuring procedural safety and efficacy. The facial artery, originating from the external carotid artery, takes a tortuous path across the face, providing arterial supply to the lips, cheeks, and nose (Lee et al., 2018). As mentioned in the previous section, the facial artery typically runs just deep to the subdermal layer (at a depth of approximately 1.5 mm) along the nasolabial fold, making it vulnerable during the traditional injection method, which is a percutaneous approach. Thus, during the process of penetrating from the skin surface to the bone surface, there is an inevitable probability of encountering the facial artery. This increases the likelihood of vascular-related complications such as bruising, hematoma, and intra-arterial injection.

However, by utilizing the intraoral approach, it is possible to directly access the deepest plane, the supraperiosteal layer. This technique allows for the theoretical avoidance of the plane where the facial artery runs, thereby potentially reducing the probability of complications related to the facial artery to zero. This approach not only minimizes the potential for vascular complications such as accidental intra-arterial injection but also significantly enhances the overall safety of the procedure by bypassing the soft tissues between the skin and the bone. (Figure 10, modified from Kim et al., 2021)

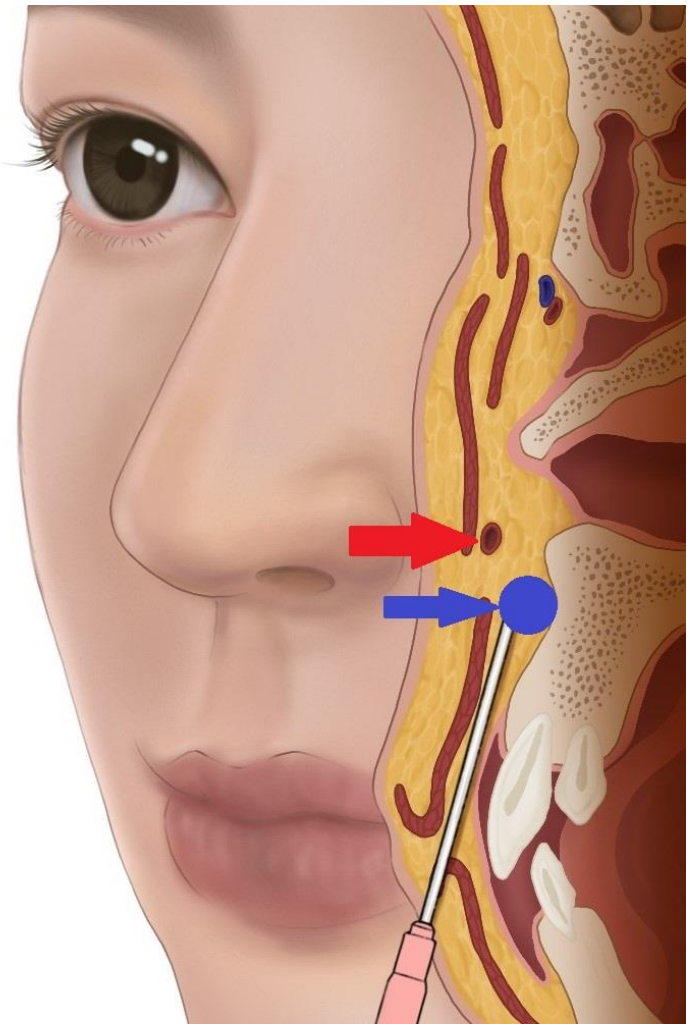

Figure 10. Illustration of the saggital section of the face related to nasolabial fold augmenation. Red arrow is facial artery, and blue arrow is a filler injection site. This demonstrates the path of the cannula of intraoral injection method. As shown in this figure, the intraoral route can avoid damaging the facial artery and other soft tissues, thereby minimizing various complications. Modified from Kim, et al., 2021

A precise understanding of facial anatomy is pivotal in guiding the cannula's path, ensuring that the filler is deposited in the ideal plane without intersecting or damaging vital vascular structures or other soft tissues, thereby minimizing various complications. Emphasizing this anatomical guidance, the intraoral route emerges as the most effective and safest alternative for administering facial fillers, particularly for correcting moderate to severe nasolabial folds. This detailed anatomical insight underscores the importance of anatomical knowledge in enhancing the safety and efficacy of aesthetic procedures, ensuring that treatments not only achieve desired aesthetic outcomes but also maintain high standards of patient safety and comfort.

Patient Satisfaction and Comfort

Post-treatment assessments highlighted high levels of patient satisfaction and comfort in both methods. Despite the mild discomfort experienced during the procedure—which aligns with common expectations for dermal filler procedures— patient reported no lasting pain or significant adverse reactions. It implies the minimal invasiveness of the intraoral injection method, and which is comparable to conventional percutaneous injection method. In addition, there is another advantage. The intraoral injection method does not create a puncture site on the skin surface, which, although very small, is still a visible wound. Thus, the patient's level of comfort is superior compared to the conventional method.

Limitations of this study

One of the primary limitations of this study is the small sample size, as it was conducted with only two patients. This limited sample size precludes any statistical analysis. Although the theoretical background is robust and efforts were made to enhance the study's comprehensiveness through cadaver experiments, it is clear that further research with a larger sample size is necessary. Additionally, studies focusing on long-term follow-up results are required to further validate the findings. Lastly, the risk of facial infection due to commensal bacteria present in the oral cavity cannot be overlooked when utilizing the intraoral route. Although prophylactic measures such as pre-procedural chlorhexidine gargling, betadine disinfection, and post-procedural antibiotic administration are implemented, these measures do not entirely eliminate the possibility of infection. Furthermore, this study did not investigate the probability of such infections, highlighting a limitation in the assessment of the intraoral approach's safety.

Further Applications

I propose the application of the intraoral route for augmentation of the malar area and infraorbital area, as well. By advancing the cannula slightly further beyond the nasolabial fold, the same technique can be utilized to reach these areas. The cannula is positioned in the subcutaneous fat layer, which is ideal for augmentation of those area (Figure 11). Similarly, this trajectory safely bypasses the facial artery, making it a significantly safer option compared to the traditional percutaneous method.

Furthermore, based on anatomical principles, it is also feasible to use a needle of appropriate length to reach the target areas instead of a cannula. While this approach may increase the likelihood of bruising, it offers a more straightforward procedure.

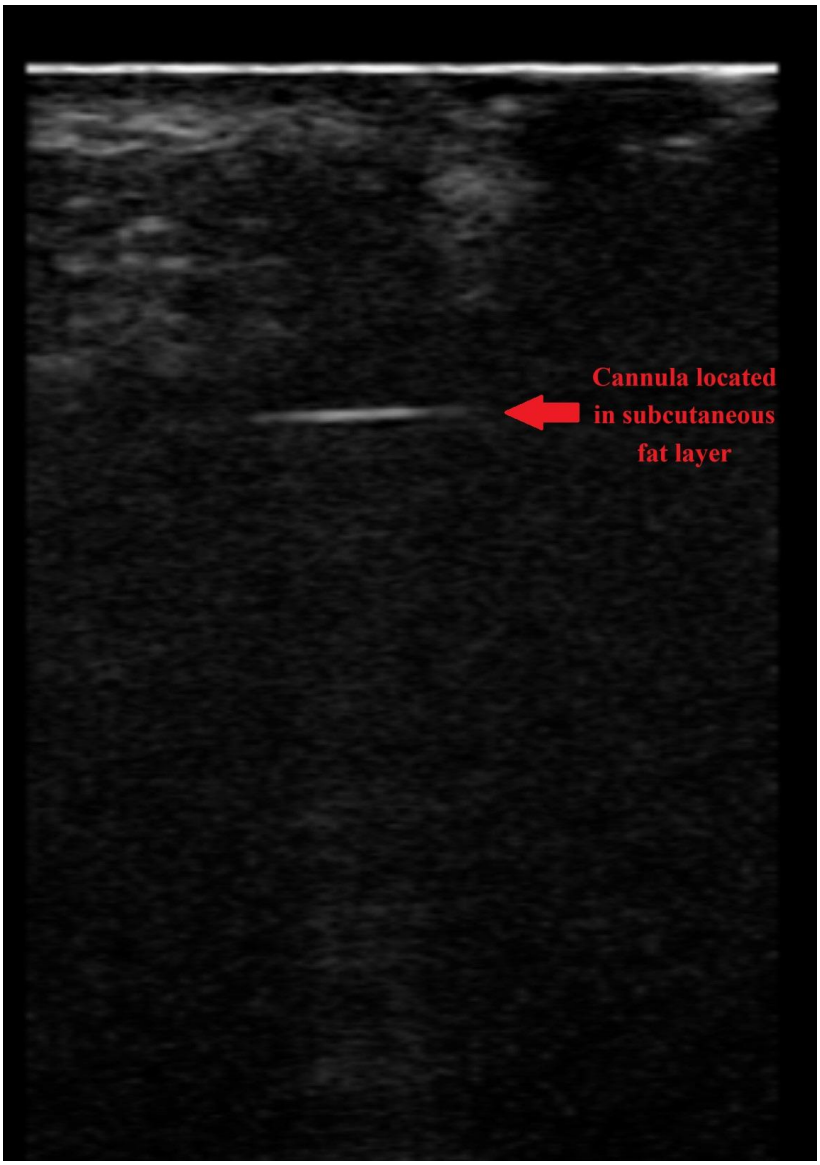

Figure 11. Placement of the cannula in the malar area using the intraoral injection method: This figure demonstrates the position of the cannula within the subcutaneous fat layer when advanced to the malar area via the intraoral route.

V. Conclusion

This study provides a detailed explanation of the intraoral injection technique for hyaluronic filler injection in nasolabial fold correction. Based on anatomical knowledge, the study compares this method to the conventional percutaneous injection method, demonstrating that the intraoral approach achieves similar effects while being anatomically safer. The experiments conducted on both patient and cadaver effectively show that the intraoral injection method significantly reduces the probability of both minor and major complications.

The conclusions of this study are as follows:

1. The intraoral route for hyaluronic acid filler injection in nasolabial fold correction is comparable to the conventional percutaneous injection method in terms of objective results, patient satisfaction, and level of comfort, thereby proving its comparable efficacy.

2. Based on anatomical knowledge, the intraoral injection method can theoretically avoid all anatomically significant structures and deliver the filler to the ideal injection plane. This makes it superior in terms of safety compared to the conventional percutaneous injection method.

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Abstract (in Korean)

미용 의학의 발전:
입옆팔자주름 교정을 위한
히알루론산 필러의 구강 내 접근법을 통한 주사 기술의
효과와 안전성

<지도교수 김희진>

연세대학교 대학원 치의학과

이 종 진

입옆팔자주름(Nasolabial fold)의 미용적 교정은 피부 미용 분야에서 중요하며, 특히 최소 침습적 미용 시술에 대한 고령화 인구의 관심이 증가함에 따라 그 중요성이 커지고 있다. 본 연구는 히알루론산 필러(Hyaluronic acid filler)를 이용한 구강 내 접근을 통한 주사 기술(Intraoral injection technique)에 초점을 맞추고 있으며, 이 기술은 전통적인 경피적 주사 방법(Conventional percutaneous injection method)에 비해 안전성과 효과 면에서 뚜렷한 장점을 제공하는 새로운 접근법이다.

히알루론산 필러는 생체 적합성, 가역적 효과 및 즉각적인 미용 개선 효과로 인해 널리 쓰이고 있으며, 피부 내 자연적으로 존재하는 히알루론산과 유사하여 조직에 부드럽게 통합될 수 있는 능력 덕분에 선호되는 필러이다. 구강 내 주사 경로는 경피적 주사 방법으로 주입 시 만나는 주요한 얼굴 혈관을 피할 수 있으며, 따라서 혈관 폐색 및 피부 괴사, 실명 등의 심각한 합병증의 위험을 크게 줄인다. 이 기술의 안전성은 얼굴의 피부조직 층 및 혈관분포에 대한 상세한 해부학적 지식을 익힘으로써 필러 주입의 깊이와 위치를 정밀하게 제어할 수 있다면 더 강화된다. 본 연구는 카데바 실험, 임상 결과 및 환자 만족도 설문을 통해 구강 내 접근법의 효과와 안전성을 평가하였다. 카데바 실험 결과 주입 깊이 및 층의 정확도가 구강내 접근 방법과 전통적인 경피적 접근 방법이 차이가 없었고, 환자를 대상으로 한 임상 결과상, 주름 심각도 등급 척도(Wrinkle Severity Rating Scale)에서 환자들이 4 등급에서 3 등급으로 개선되는 경피적 접근방법과 차이가 나지 않아 구강 내 주사법이 입옆팔자주름을 개선하고 젊은 외모를 회복하는 데 경피적 접근 방법과 마찬가지로 효과적임을 강조한다. 또한, 환자들의 피드백은 매우 긍정적이었으며, 시술 결과와 시술 중 불편감 측면에서는 구강 내 주입법이 높은 만족도가 나타났다. 또한 해부학적 고찰 결과 경피적 접근 방법은 얼굴혈관을 피할 수 없는 반면, 구강 내 주입법의 경우 얼굴 혈관의 주행 깊이를 완전히 우회하며 피할 수 있기 때문에 해부학적으로 훨씬 더 안전하다.

본 논문은 이 혁신적인 기술의 임상 적용을 제시하고, 미용 시술의 미래에 대한 함의를 논의하며, 전통적인 주사 방법에 대한 안전하고 효과적인 대안으로서의 구강내 주사법의 광범위한 도입을 제안한다. 포괄적인 해부학적 지식을 통합함으로써 이 접근법은 안면 미용 시술의 새로운 표준을 확립할 가능성이 있으며, 환자의 안전과 편안함을 우선시하면서도 미용 결과를 저해하지 않는 새로운 치료 기준을 제시한다.

핵심 되는 말: 히알루론산 필러, 최소침습적 시술, 입옆팔자주름, 필러주사, 구강내주사법