ORIGINAL RESEARCH

Study and Analysis of the Clinical Effects and Maintenance Duration of Facial Rejuvenation Treatment in Middle-Aged and Elderly Individuals through the Combined Use of Facial Hyaluronic Acid Fillers and PPDO Thread Lift

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ABSTRACT

Objective • This study aims to compare the clinical efficacy and longevity of facial rejuvenation treatments using PPDO thread lifts alone versus in combination with facial hyaluronic acid fillers in middle-aged and elderly patients.

Methods • A retrospective analysis of case data was conducted on 92 middle-aged and elderly patients treated in our hospital with suboptimal facial contours or signs of aging from January 2016 to January 2017. Patients who exhibited facial aging issues and desired rejuvenation, had complete case data for analysis, received treatments at our hospital, and agreed to 5-year post-treatment follow-up were included. Based on the different treatment interventions received by the patients, they were divided into the control group (n=43) and the observation group (n=49). Patients in the control group received standalone PPDO thread lift intervention, while patients in the observation group received a combination of facial hyaluronic acid filler in addition to the treatment received by the control group. Clinical treatment effects, complication rates, facial improvement maintenance duration, and facial contour scores were compared between the two groups at different time points (preoperative, T0; postoperative 1 month, T1; postoperative 3 months, T2; postoperative 6 months, T3; and postoperative 12 months, T4).

Results • The observation group, receiving both PPDO thread lifts and hyaluronic acid fillers, demonstrated a significantly higher total effective treatment rate of 89.80% compared to 72.09% in the control group treated solely with PPDO thread lifts. Within the initial month post-surgery, the observation group experienced rates of facial pain, swelling, bruising, concavity, and thread extrusion at 61.22%, 53.06%, 30.61%, 20.41%, and 0.00%, respectively, while the control group experienced rates at 55.81%, 48.84%, 39.53%, 20.93%, and 2.33%, respectively. No significant difference in complication rates was observed between the two groups ($P > .05$). The combined treatment method resulted in a significantly prolonged facial improvement maintenance duration, averaging 4.67 years, compared to 4.13 years in the control group. At T0, facial contour scores showed no significant difference between the groups ($P > .05$); however, at T1, T2, T3, and T4, the observation group exhibited significantly higher scores compared to the control group ($P < .05$). Although there were variations in the types of complications, the overall rates of complications did not show a significant difference between the two groups, thus affirming the safety of the combined treatment.

Conclusion • The study concludes that combining facial hyaluronic acid fillers with PPDO thread lifts offers superior facial rejuvenation outcomes and longer-lasting effects without increasing complication risks, proving to be a highly safe and effective strategy for middle-aged and elderly patients seeking facial aesthetic improvements. (*Altern Ther Health Med.* [E-pub ahead of print.])

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INTRODUCTION

In contemporary society, the pursuit of beauty and a youthful appearance has gained increasing prominence, particularly among the middle-aged and elderly population. As individuals age, they often encounter facial aging concerns, such as skin laxity, diminished facial contours, and the development of wrinkles.[1] Facial aging can significantly impact psychological well-being and social interactions, influencing self-esteem, confidence, and emotional health. Addressing these aspects is crucial in understanding the holistic impact of rejuvenation treatments on individuals' overall quality of life and interpersonal relationships.[2] Consequently, there is a growing demand among middle-aged and elderly individuals for facial rejuvenation treatments.

To meet this demand, cosmetic medicine has witnessed continuous evolution and innovation, offering a range of surgical and non-surgical treatment modalities to help middle-aged and elderly individuals achieve a more youthful appearance. Among the available options, facial hyaluronic acid fillers and polydioxanone (PPDO) thread lift techniques have garnered considerable attention.[3]

Facial hyaluronic acid filler procedures represent widely utilized non-surgical cosmetic interventions. By injecting hyaluronic acid beneath the facial skin, these procedures effectively improve facial contours, restore lost facial volume, and mitigate the appearance of wrinkles.[4] Hyaluronic acid fillers work by attracting water molecules to the skin, improving hydration and restoring volume lost due to aging. This process helps smooth out wrinkles and enhance facial contours.[5]

On the other hand, PPDO thread lift involves the insertion of absorbable threads beneath the facial skin. This threading technique effectively lifts sagging facial skin and tissues, leading to a rejuvenated appearance.[6] Compared to traditional facelift surgery, PPDO thread lift is a lower-risk procedure with a shorter recovery period. Furthermore, the

absorbable nature of the threads mitigates the risk of residue formation, minimizing surgical trauma and discomfort.[7] Moreover, PPDO thread lifts involve the insertion of absorbable threads beneath the skin, which stimulate collagen production. Over time, this increased collagen production enhances the skin's natural firmness and elasticity, leading to a lifted and rejuvenated appearance.[8]

However, acknowledging the limitations of both hyaluronic acid fillers and PPDO thread lift techniques is crucial for understanding their impact on patient satisfaction and treatment efficacy. Hyaluronic acid fillers, while effective in restoring facial volume and reducing wrinkles, offer temporary results that require regular maintenance sessions.[9] This temporariness can affect patient satisfaction due to the recurring need for treatments and associated costs. On the other hand, although PPDO thread lifts provide longer-lasting effects, they may not comprehensively address issues such as significant volume loss or deep wrinkles.[10] By addressing these limitations more thoroughly, we can better appreciate the rationale for combining these techniques to offer a more comprehensive and enduring solution for facial rejuvenation in middle-aged and elderly individuals. Combining hyaluronic acid fillers with PPDO thread lifts offers a promising approach to facial rejuvenation, synergizing immediate volume restoration with long-term lifting effects. Limited research suggests potential benefits, warranting further study to validate the efficacy and safety of comprehensive facial rejuvenation.[11]

Our study offers new insights by examining the combined approach of hyaluronic acid fillers and PPDO thread lifts for facial rejuvenation in middle-aged and elderly individuals. Addressing a gap in existing research, we provide comprehensive long-term data on maintenance duration and safety outcomes over a 5-year follow-up period, informing future treatment strategies in cosmetic medicine. This study specifically aims to: 1) Evaluate the immediate and long-term clinical effects of combining facial hyaluronic acid fillers with PPDO thread lifts; 2) Compare complication rates between combined treatment and PPDO thread lifts alone; 3) Assess the maintenance duration of facial contour improvements with combined therapy.

OBJECTIVES AND METHODS

Study Subjects

The study was performed to assess the clinical effectiveness, safety, and maintenance duration of facial rejuvenation treatment through a combined approach of hyaluronic acid fillers and PPDO thread lifts in middle-aged and elderly individuals, compared to PPDO thread lifts alone. Additionally, it seeks to evaluate the impact of combined therapy on facial contour improvement over a 12-month period. A retrospective analysis was conducted on case data of 92 middle-aged and elderly patients with suboptimal facial contours or signs of aging who were admitted to our hospital between January 2016 and January 2017.

Inclusion criteria: (1) Patients exhibited various degrees of facial aging issues such as skin laxity, sagging of the mandibular border, and deep nasolabial folds, had a strong desire for facial rejuvenation, and met the surgical indications; (2) Patient case data were complete and available for analysis; (3) Patients received relevant treatments at our hospital; (4) Patients were willing to cooperate with post-treatment follow-up observations.

Exclusion criteria: (1) Patients with severe organ dysfunction, disorders of the immune system, coagulation function, cardiovascular diseases such as myocardial infarction and stroke, a history of facial burns or pathological scarring, in the lactation or pregnancy period, and with allergies or contraindications to the treatment drugs, methods, and procedures used in this study were excluded; (2) Patients with incomplete clinical data or low compliance, making them unable to cooperate with the study and subsequent follow-up.

This study was conducted in accordance with the "Helsinki Declaration."[12] All participants have provided written informed consent, and this study has been approved by the ethics committee of our hospital. The ethical approval number is 2016-01-005.

Methods

Pre-procedural Assessments: (1) Prior to interventions, patients underwent individualized assessments to tailor treatment plans to their specific facial concerns and goals.

(2) Entry and exit points for PPDO threads were marked based on facial laxity and sagging severity, ensuring precise placement.

(3) Dosage and injection sites for hyaluronic acid filler were determined according to each patient's facial anatomy and desired outcomes, aiming for natural-looking results.

In the control group, patients underwent the PPDO thread lift intervention using the following standardized procedures. The skin was routinely disinfected and prepared. Entry and exit points for the PPDO threads were marked with dental floss at the hairline and anterior to the earlobe, taking into account the patient's facial laxity and degree of sagging. Two to four PPDO threads were implanted from the front of the ear to the corner of the mouth and from the hairline to the nasolabial fold. In areas with dynamic facial wrinkles, injection points were designed based on the patient's muscle range and contraction strength. Local anesthesia was administered at the lifting and entry points. A suitable puncture needle was selected and inserted into the skin at a 30° angle, reaching the superficial muscular aponeurotic system (SMAS) layer corresponding to the lifting site. The thread was then advanced toward the puncture needle until reaching the endpoint, where it was secured in the soft tissue. The sagging tissue was lifted, and the needle was retracted. After needle retraction, the facial skin and soft tissue were symmetrically lifted, ensuring no exposure of the thread end or active subcutaneous bleeding. Antibiotic ointment was applied externally to prevent infection, and gentle pressure was applied to the face using an elastic face

mask for 48 hours postoperatively. A follow-up visit was scheduled 24 hours after the surgery for a dressing change and facial icing. Patients were instructed to avoid excessive facial movement, massage, and rubbing for 30 days after treatment.

In the observation group, patients received a combined intervention of facial hyaluronic acid filler in addition to the treatment provided to the control group. The specific measures for the facial hyaluronic acid filler procedure were as follows: Under local anesthesia, hyaluronic acid filler was prepared for injection into the patient's cheek and areas of depression in the apple muscle, based on the patient's specific facial condition. The dosage of filler was determined accordingly, with a total injection volume controlled to be ≤2 mL. After the completion of filling, the PPDO thread lift treatment was performed using the same methods and procedures as in the control group, taking into account the patient's facial condition and nose shape.

Observation Metrics

To minimize bias, assessments of facial improvement were standardized using blinded evaluators and objective measurement tools where applicable, ensuring consistency and reliability in the evaluation process.

Clinical Treatment Effect: Evaluation was based on the patient's facial appearance post-treatment improvement. Categories included: Excellent: Patients exhibited a youthful and natural facial appearance after treatment, achieving the expected preoperative results. Good: Patients demonstrated significant facial rejuvenation with a natural appearance after treatment, showing some variation from the expected outcome. Fair: Patients displayed modest facial rejuvenation with a somewhat natural appearance after treatment, exhibiting a noticeable difference from the expected outcome, which the patients could accept. Poor: Patients still exhibited an aged or unnatural facial appearance after treatment, which they found unacceptable. The overall treatment effectiveness was calculated as the rate of excellent and good outcomes, expressed as the percentage: (Excellent + Good) cases / Total cases × 100%.

Occurrence of Complications: Complications occurring within one-month post-surgery were documented for both groups. The complications observed in this study included facial pain, facial swelling, bruising, contour irregularities, and thread exposure. The occurrence of these complications was uniformly recorded by the relevant medical staff at our hospital.

Duration of Facial Improvement Maintenance: Both groups of patients underwent a 5-year follow-up during which the duration of excellent and good facial improvement after treatment was recorded.

Facial Contour Rating: At various time points, including preoperative (T0), one month postoperative (T1), three months postoperative (T2), six months postoperative (T3), and twelve months postoperative (T4), the patient's facial contours were assessed using a self-developed facial contour rating table at our hospital. This rating scale included three items: facial wrinkles, mandibular border morphology, and nasolabial groove morphology, each rated on a 5-point aesthetic scale. The total score ranged from 0 to 12, with higher scores indicating better facial contour status.

Statistical Analysis

GraphPad Prism 8 was used for graphical representation, and SPSS 22.0 was employed for data analysis. Continuous data were described using means and standard deviations, with statistical analysis conducted using *t* tests or analysis of variance as appropriate. For categorical data, frequencies and percentages were used, with statistical analysis performed using chi-square tests or Fisher's exact tests. In addition to the main analyses, we plan to explore any potential subgroup effects or interaction effects based on specific patient characteristics. This includes factors such as age, gender, baseline severity of facial aging concerns, and previous treatment history, which may influence treatment outcomes differently. Subgroup analyses will be conducted to assess the differential effects of the combined intervention within these subpopulations. A significance level of $P < .05$ was used to indicate statistical significance in all analyses. Missing data will be addressed through appropriate imputation methods to maintain the integrity of statistical analyses. Depending on the nature of missingness, techniques such as multiple imputation will be utilized. Sensitivity analyses will be conducted to assess the robustness of results. If data are missing not at random, alternative methods will be explored, with transparent reporting of associated limitations.

Sample Size Justification

The sample size for this study was determined based on power calculations to ensure adequate statistical power to detect meaningful differences between groups. Given the anticipated effect sizes from previous literature and clinical experience, a power analysis was conducted using G*Power software.

For the primary outcome measures, including the total effective rate of treatment and duration of facial improvement maintenance, we aimed to achieve a power of 80% or higher at a significance level of .05. Based on these considerations, a sample size of 92 patients (divided equally between the control and observation groups) was determined to be sufficient to detect clinically significant differences between groups.

Additionally, this sample size allows for subgroup analyses to explore potential interaction effects and assess the impact of patient characteristics on treatment outcomes with adequate statistical power.

Therefore, the sample size of 92 patients was deemed appropriate to ensure the study's ability to detect meaningful differences between groups and provide reliable conclusions regarding the effectiveness and safety of the combined intervention for facial rejuvenation in middle-aged and elderly individuals.

Potential limitations

One potential limitation of this study is its retrospective design, which may introduce inherent biases and limitations compared to prospective studies. To mitigate this, rigorous

Table 1. Baseline Data Comparison

Variables	Control (n=43)	Observation (n=49)	t/χ^2	*P* value
Gender			0.032	.857
Male	3	4		
Female	40	45		
Age (years)	53.49±3.86	52.97±4.05	0.628	.531
Severity of Facial Issues			0.898	.343
Severe	11	17		
Moderate	17	19		
Mild	15	13		
Number of Hyaluronic Acid Fillings			0.080	.776
≤1 time	31	34		
≥2 times	12	15		

Table 2. Comparison of Clinical Treatment Effect

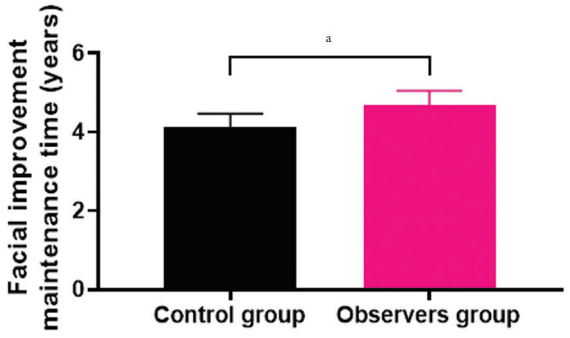
Group	n	Excellent	Good	Fair	Poor	Total Effectiveness (%)
Control	43	11	20	9	3	72.09%
Observation	49	18	26	4	1	89.80%
χ^2	-	-	-	-	-	4.764
P value	-	-	-	-	-	0.029

Note: Total treatment effectiveness = Rate of Excellent and Good outcomes = (Excellent + Good) cases / Total cases × 100%.

Table 3. Comparison of Complication Incidence

Complication	Control (n=43)	Observation (n=49)	χ^2	*P* value
Facial Pain	24 (55.81%)	30 (61.22%)	0.276	.599
Facial Swelling	21 (48.84%)	26 (53.06%)	0.163	.686
Facial Bruising	17 (39.53%)	15 (30.61%)	0.803	.370
Facial Irregularities	9 (20.93%)	10 (20.41%)	0.003	.950
Thread Extrusion	1 (2.33%)	0 (0.00%)	0.0	1.0

Figure 1. Comparison of Face Improvement Maintenance Time



[a]indicates a statistically significant difference between the groups ($P < .05$).

data collection methods will be employed, and efforts will be made to minimize selection bias and ensure the accuracy and completeness of collected data. Additionally, sensitivity analyses will be conducted to assess the robustness of findings and address any potential biases introduced by the retrospective nature of the study. Despite these limitations, the large sample size and comprehensive data collection aim to provide valuable insights into the effectiveness and safety of the interventions under investigation.

RESULTS

Baseline Data Comparison

The baseline data of the two groups of patients were comparable, and there were no significant differences in the comparisons ($P > .05$). This comparability is crucial as it ensures the validity of treatment effect comparisons. Refer to Table 1 for details.

Comparison of Clinical Treatment Effect

At the 12-month follow-up, the total treatment effectiveness in the control group was 72.09%, while in the observation group, it was 89.80%. The treatment effectiveness in the observation group was significantly higher than in the control group ($P < .05$). Please refer to Table 2 for details.

Patients classified under "Excellent" and "Good" outcomes experienced substantial visual and functional improvements in their facial appearance. "Excellent" outcomes signify a youthful and natural facial appearance, meeting or exceeding preoperative expectations. Similarly, "Good" outcomes denote significant facial rejuvenation with a natural appearance, albeit with some variation from the expected outcome.

In practical terms, patients classified under these categories experienced noticeable reductions in skin laxity, improved facial contours, and diminished wrinkles. These improvements not only enhance aesthetic appearance but also contribute to increased self-confidence and improved quality of life.

The significantly higher treatment effectiveness observed in the observation group underscores the comprehensive benefits of the combined intervention, which includes both PPDO thread lift and hyaluronic acid filler procedures. This suggests that the synergistic effects of these treatments lead to superior outcomes compared to PPDO thread lift alone.

Comparison of Complication Incidence

Within 1 month after the surgery, the incidence of facial pain, swelling, bruising, irregularities, and extrusion of threads in the control group was 55.81%, 48.84%, 39.53%, 20.93%, and 2.33%, respectively. In the observation group, the incidence of facial pain, swelling, bruising, irregularities, and extrusion of threads was 61.22%, 53.06%, 30.61%, 20.41%, and 0.00%, respectively. The incidence of complications between the two groups was compared ($P > .05$). Please refer to Table 3 for details.

Despite the absence of significant differences, this finding is clinically significant. It indicates that the combined treatment approach, involving both PPDO thread lift and hyaluronic acid filler procedures, does not increase the risk of complications compared to PPDO thread lift alone. This reassures about the safety of combining these treatments and highlights the importance of proper patient selection and surgical technique.

Comparison of Face Improvement Maintenance Time

As shown in Figure 1, both groups of patients were followed up for 5 years. The maintenance time for face improvement in the control group was (4.13±0.34) years, while in the observation group, it was (4.67±0.38) years. The observation group's maintenance time for face improvement was significantly higher than that of the control group ($P < .05$).

The complementary actions of hyaluronic acid fillers and PPDO thread lift likely to contribute to this extended maintenance. Hyaluronic acid fillers provide immediate

volume restoration and hydration, while PPDO threads stimulate collagen production and tissue tightening over time. Together, they enhance structural support and address multiple aspects of facial aging, resulting in more enduring outcomes.

This finding underscores the potential benefits of combining these treatments for prolonged aesthetic enhancement, warranting further investigation into their synergistic mechanisms.

Comparison of Face Contour Scores

As shown in Figure 2, the face contour scores for the control group at T0, T1, T2, T3, and T4 were (5.13±1.34, 6.52±1.47, 7.44±1.23, 7.79±1.35, 7.96±1.39), respectively. For the observation group at T0, T1, T2, T3, and T4, the face contour scores were (5.21±1.32, 7.38±1.26, 8.09±1.27, 8.53±1.32, 8.84±1.41), respectively. At T0, there was no statistically significant difference in face contour scores between the two groups ($P > .05$). However, at T1, T2, T3, and T4, the observation group had significantly higher face contour scores than the control group ($P < .05$).

The improved face contour scores in the observation group likely translate into tangible benefits for patients, such as enhanced facial symmetry, smoother skin texture, and reduced signs of aging. These aesthetic improvements can have a profound impact on patient satisfaction and quality of life by boosting self-confidence, improving social interactions, and enhancing overall well-being.

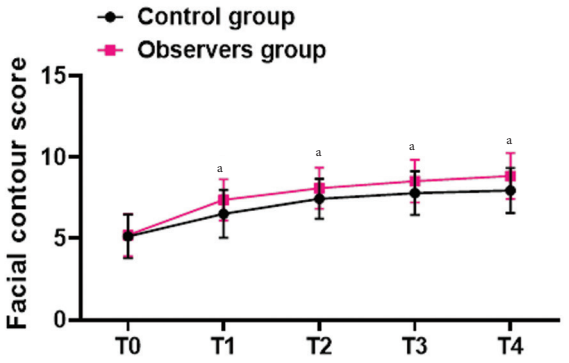
Furthermore, the sustained superiority of face contour scores in the observation group suggests that the combined intervention of hyaluronic acid fillers and PPDO thread lift offers long-term aesthetic benefits beyond what can be achieved with PPDO thread lift alone. This underscores the clinical relevance of adopting a comprehensive approach to facial rejuvenation that addresses multiple aspects of facial aging concurrently.

Limitations and Future Directions

While our study provides valuable insights into the effectiveness of combined facial rejuvenation treatments, it is essential to acknowledge certain limitations. Firstly, the retrospective design of the study may introduce inherent biases and limit the ability to establish causality. Additionally, the sample size, although adequate for our analyses, may restrict the generalizability of our findings to broader populations. Moreover, the follow-up duration, while spanning five years, may not capture longer-term outcomes or potential late complications. Despite these limitations, our results offer valuable contributions to the understanding of facial rejuvenation outcomes and highlight avenues for future research.

Our findings suggest several avenues for future research within the field of facial rejuvenation. Firstly, investigating longer-term outcomes beyond the five-year follow-up period could provide deeper insights into the durability of combined treatment approaches. Additionally, comparative studies exploring the efficacy and safety of different types of fillers or thread lift materials may help optimize treatment selection and improve patient outcomes. Furthermore, assessing patient-reported outcomes, such as satisfaction and quality of life measures, would enrich our understanding of the holistic impact of facial rejuvenation interventions. By addressing these research gaps, future studies can build upon our findings and further advance the field of cosmetic medicine.

Figure 2. Comparison of Face Contour Scores



[a]indicates a statistically significant difference between the groups ($P < .05$).

Note: Preoperative (T0), 1 month postoperative (T1), 3 months postoperative (T2), 6 months postoperative (T3), 12 months postoperative (T4);

DISCUSSION

This study addresses the significant impact of aging-related issues like skin laxity and decreased elasticity on facial aesthetics, prompting many individuals to seek facial rejuvenation interventions. While cosmetic products offer temporary relief, they fail to address underlying structural changes associated with aging. Facial surgeries, including PPDO thread lifting and hyaluronic acid fillers, have emerged as popular options for individuals seeking long-lasting solutions. In our retrospective analysis of 92 middle-aged and elderly patients, we aimed to evaluate the effectiveness of combining these two techniques to achieve comprehensive facial rejuvenation.

Issues such as skin laxity and decreased elasticity are inevitable consequences of aging, and these problems significantly impact the facial aesthetics of patients.[13] While long-term use of cosmetics can slow down the aging process of the skin, it cannot provide a fundamental solution to these issues. Moreover, the use of cosmetics is associated with drawbacks like the risk of allergies and noticeable rebound effects upon discontinuation.[14] Consequently, many middle-aged and elderly individuals are turning to facial surgeries to regain a youthful appearance. In this study, we conducted a retrospective analysis of case data for 92 middle-aged and elderly patients with suboptimal facial contours and signs of aging who were treated at our hospital. These patients ranged in age from 45 to 70 years and primarily presented with issues like sagging skin in the temporal and cheek regions, drooping brows and upper eyelids. Clinical interventions mainly involved PPDO thread lifting, fat grafting, and hyaluronic acid injections.

PPDO thread lifting is a technique that involves the injection of PPDO collagen into the face to address the issues associated with facial aging. This technique employs specially designed guide needles to introduce PPDO collagen threads into the superficial soft tissues. Through the lifting action of PPDO threads, it combats the sagging and drooping of soft tissues, facilitating facial rejuvenation.[15] The PPDO threads are buried within the skin tissues, gradually undergoing absorption. During this absorption process, PPDO continually stimulates collagen regeneration, promoting the formation of new support ligaments and elastic fibers in aged skin, thus delaying facial skin aging.[16] However, extended clinical experience has revealed that while PPDO thread lifting can offer short-term improvement in issues like facial skin sagging, patients often experience reduced skin elasticity and the reappearance of facial wrinkles when the PPDO threads are fully absorbed. This necessitates multiple PPDO thread-lifting procedures, increasing the risk of complications and resulting in low patient satisfaction levels.[17] Hyaluronic acid is a substance widely found in the natural world connective tissues, mucous tissues, and crystalline lenses of vertebrates. In this study, we attempted to combine facial hyaluronic acid filling with PPDO thread lifting to treat facial rejuvenation in middle-aged and elderly individuals. The aim was to further enhance the effectiveness of facial rejuvenation treatments while also improving their long-term sustainability and safety. When combined, hyaluronic acid fillers and PPDO thread lifts exert complementary effects that synergistically enhance facial rejuvenation. Hyaluronic acid fillers provide immediate volume restoration and hydration, creating a foundation for optimal tissue support. Concurrently, PPDO threads lift and tighten sagging skin, while also promoting collagen production for sustained improvements. This dual-action approach addresses both superficial and deep structural changes associated with facial aging, resulting in comprehensive rejuvenation and natural-looking results. Furthermore, the combination of hyaluronic acid fillers with PPDO thread lifts may prolong the longevity of treatment outcomes. Hyaluronic acid acts as a scaffold for collagen deposition, enhancing the integration and longevity of PPDO threads within the skin. Conversely, the mechanical support provided by PPDO threads may help maintain the distribution and effectiveness of hyaluronic acid fillers over time. This mutual reinforcement between the two treatments contributes to prolonged improvements in facial contour and texture.[10]

While specific cost data may vary depending on factors like geographic location and individual patient needs, discussing the potential cost-effectiveness of the combined treatment approach can provide valuable insights. Compared to traditional facelift surgery, which typically involves higher upfront costs, the combined hyaluronic acid filler and PPDO thread lift approach may offer a more cost-effective alternative with similar or even superior results. Additionally, considering the longer maintenance duration associated with the combined approach, patients may experience fewer repeat treatments over time, potentially reducing long-term expenses. However, further research is needed to comprehensively assess the cost-effectiveness of this approach and its implications for both patients and healthcare providers.

The results of this study show that at the 12-month follow-up, the total effective rate of treatment in the control group was 72.09%, while the observation group achieved a significantly higher total effective rate of 89.80% ($P < .05$). Within the first month after surgery, the occurrence rates of complications did not significantly differ between the two groups ($P > .05$). Both groups were followed for five years, during which the control group's maintenance of facial improvement lasted for 4.13 ± 0.34 years, whereas the observation group had a significantly longer maintenance period of 4.67 ± 0.38 years ($P < .05$). At T1, T2, T3, and T4, the observation group's facial contour scores were significantly higher than the control group's ($P < .05$). The above research findings are consistent with previous studies,[28,19] indicating that applying facial hyaluronic acid filling in combination with PPDO thread lifting in treating facial rejuvenation in elderly individuals is promising. This combination therapy can further enhance treatment effectiveness, extend the duration of facial improvement, and does not increase the risk of related complications. It promotes an overall improvement in the treatment of patients with suboptimal facial contours. Besides, patient selection criteria are also an important factor in patient recovery. Patient selection criteria, encompassing factors like skin laxity, overall skin health, and aesthetic goals, are pivotal in determining the success of combined hyaluronic acid filler and PPDO thread lift treatments. Moderate to severe skin laxity, good skin quality, and aligned aesthetic expectations are key indicators for favorable outcomes. By tailoring treatment plans to individual needs, practitioners can optimize rejuvenation results and enhance patient satisfaction.

While the combined hyaluronic acid filler and PPDO thread lift approach offers notable advantages in facial rejuvenation, it is essential to consider alternative treatments like laser therapy, chemical peels, and traditional facelift surgery. Laser therapy and chemical peels primarily target surface irregularities and skin texture, offering minimal improvement for deep tissue sagging. In contrast, traditional facelift surgery provides more dramatic and long-lasting results but involves higher risks and longer recovery times. Compared to these options, the combined approach offers a balance of immediate volume restoration with long-term collagen stimulation, making it suitable for patients seeking moderate to significant improvement in facial contours without undergoing invasive surgery or lengthy recovery periods.[20]

Environmental and lifestyle factors play a significant role in influencing the effectiveness and maintenance of treatment results in facial rejuvenation. Factors such as sun exposure, smoking, diet, and skincare routines can impact skin health and aging processes. For instance, prolonged sun exposure without adequate protection can accelerate skin aging and diminish the longevity of treatment outcomes. Similarly, unhealthy lifestyle habits like smoking can impair skin circulation and collagen production, affecting the overall

efficacy of rejuvenation treatments. Encouraging patients to adopt skin-healthy lifestyles, including sun protection practices, smoking cessation, balanced nutrition, and appropriate skincare regimens, can complement the benefits of facial rejuvenation treatments. Integrating lifestyle counseling into treatment plans may optimize outcomes and promote long-term skin health. Future research could explore the synergistic effects of treatment interventions and lifestyle modifications, providing valuable insights into holistic approaches to facial rejuvenation.

However, while this study provides valuable information about the clinical effectiveness of facial hyaluronic acid filling combined with PPDO thread lifting in facial rejuvenation treatment for middle-aged and elderly individuals, there are some limitations to this research: (1) Limited Sample Size: This study had a relatively small sample size, consisting of only 92 middle-aged and elderly patients. The limited sample size may restrict the generalizability of the study results. (2) Retrospective Study Design: This study used a retrospective design, meaning the data were analyzed based on existing medical records. This design can lead to data incompleteness and omissions due to record-keeping and data quality variations. (3) Subjective Assessment of Treatment Effect: The study assessed treatment effectiveness through facial contour scores, which can have a degree of subjectivity. More objective assessment methods may provide more accurate data supporting the study's conclusions. (4) Patient Satisfaction and Quality of Life: While our study focused on clinical outcomes and objective measures of treatment effectiveness, the subjective experiences and perceptions of patients are equally important in evaluating the overall success of facial rejuvenation interventions. Future research should incorporate robust measures to assess patient satisfaction, aesthetic outcomes, and the impact of treatment on quality of life, providing a more comprehensive understanding of the benefits and limitations of the combined hyaluronic acid filler and PPDO thread lift approach. (5) Future Research Directions: Given the limitations identified in our study, future research could explore several avenues to further advance our understanding of facial rejuvenation treatments. Firstly, larger-scale studies involving diverse patient populations could help validate the effectiveness of the combined hyaluronic acid filler and PPDO thread lift approach across a broader spectrum of individuals. Additionally, longitudinal research focusing on long-term outcomes and durability of results would provide valuable insights into the sustained effects of this treatment strategy. Furthermore, comparative studies evaluating the combined approach against other rejuvenation modalities, such as laser therapy or facelift surgery, could offer valuable information on treatment efficacy and patient preferences. By addressing these research gaps, we can continue to refine and optimize facial rejuvenation protocols for enhanced patient outcomes.

The implications of our findings extend beyond individual patient outcomes to broader trends in cosmetic medicine. The combined approach offers a comprehensive solution to facial aging, addressing both volume loss and skin laxity simultaneously. This integration of different modalities reflects a shift towards personalized treatment protocols that tailor interventions to each patient's unique needs and concerns. In the spectrum of available facial rejuvenation options, the combined use of hyaluronic acid fillers and PPDO thread lifts occupies a distinct position. While each modality can yield significant improvements on its own, their synergy enhances treatment effectiveness and prolongs results, offering patients a more comprehensive solution to facial aging.

Looking ahead, the adoption of combined treatment protocols is likely to become increasingly common in cosmetic practice. Future research should focus on refining these protocols, optimizing treatment outcomes, and exploring innovative techniques that further enhance facial rejuvenation. By embracing a multifaceted approach to facial aesthetics, practitioners can meet the evolving needs and expectations of patients, ultimately redefining standards of beauty and aging gracefully in the modern era of cosmetic medicine.

CONCLUSION

In conclusion, the combined application of facial hyaluronic acid filling with PPDO thread lifting represents a significant advancement in the field of cosmetic treatments for aging. Our study demonstrates that this combined approach not only effectively addresses suboptimal or aging facial contours in middle-aged and elderly individuals but also extends the duration of treatment efficacy without increasing the risk of additional complications. These findings underscore the importance of safety in cosmetic procedures and highlight the potential for improving patient outcomes in facial rejuvenation.

From a patient-centric perspective, the benefits of this combined approach extend beyond physical improvements to encompass enhanced self-esteem, improved social interactions, and overall satisfaction with one's appearance. By humanizing the data, we emphasize the tangible impact of our findings on individuals seeking facial rejuvenation treatments.

While our study provides promising results, further research is warranted to explore the long-term effects, cost-effectiveness, and patient satisfaction associated with this combined treatment. Future studies could delve into these areas to provide valuable insights into the practical implications of our findings for cosmetic practitioners and patients alike.

Moreover, considering the potential for broader applications, it is conceivable that younger individuals or those with mild signs of aging may also benefit from this approach. This opens up avenues for future research to investigate the applicability of the combined treatment across different demographic groups.

Looking ahead, we envision the integration of these findings into clinical practice, shaping the future of non-surgical facial rejuvenation. By continually refining and

optimizing treatment approaches, we can further enhance patient outcomes and satisfaction, ultimately advancing the field of cosmetic medicine.

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