Original article

Kinesio taping: A novel approach to reducing facial wrinkles and sagging skin

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Abstract. *Background:* the tension in Kinesio taping (KT) is a critical aspect influencing biomechanical changes in the skin. *Aim:* this study aimed to explore the impact of a 4-week KT application on facial wrinkles, skin sagging, and elasticity in elderly women. *Methods:* ten elderly women participated in the intervention, which targeted five facial regions. Skin assessments included the measurements of firmness (R0), elasticity (R2), viscoelasticity (R5), and skin recovery (R7), alongside evaluations of the wrinkle severity rating scale and self-satisfaction. *Results:* the study found a decrease in skin firmness (R0) at the left eye corner and both nasolabial folds, with significant improvement in firmness at the nasolabial folds. Elasticity (R2) significantly increased at the right nasolabial fold, while viscoelasticity (R5) showed an upward trend across all sites, though not statistically significant. Skin recovery (R7) improved at the forehead, right eye corner, and left nasolabial fold, with a significant reduction at the right nasolabial fold. *Conclusion:* these findings suggest that KT may enhance facial skin properties in elderly women, improving elasticity and reducing wrinkles. However, further research with a larger sample size is needed to confirm these preliminary results.

Key words: Kinesio taping, skin elasticity, sagging skin, facial wrinkles, facial rejuvenation

Introduction

In the contemporary era, the growing demand for rejuvenation propels the thriving anti-aging industry, with the global market valued at approximately US$58.5 billion in 2020 and anticipated to witness a compound annual growth rate of 7% between 2021 and 2026[1]. Aesthetic medicine aims to rejuvenate the skin, enhance elasticity, and reduce wrinkles[2]. Invasive cosmetic procedures for facial rejuvenation, including hyaluronic acid injections, botulinum toxin treatment, and thread lifting, can lead to complications after the procedure[3-5]. Additionally, they are costly and may cause discomfort due to the extended recovery period. For this reason, non-invasive methods such as makeup, facial massage, facial muscle training, and facial exercises are gaining popularity[6-8].

Kinesio taping (KT) is extensively used in clinical settings for pain management and rehabilitation[9]. KT can extend to 120–140% of its original length and retract to its initial length upon application, creating skin tension[10]. The KT method elevates the interstitial space under the skin and soft tissue, expanding movement space, improving blood and lymphatic fluid circulation, and enhancing tissue healing[10]. The application of KT to the face is primarily utilized for treating Bell's palsy, a condition that affects facial muscles, and for restoring motor function in facial expression muscles[11,12]. External tissue expansion primarily stimulates the skin tissue's mechanical creep[13]. Tape tension is a crucial aspect of the KT method[14]. Therefore, if KT is applied to the face, it is thought to act as an external stimulus and continuously lift sagging skin against the force of gravity. Neuro-facilitation - where stimulation

of skin mechanoreceptors via reflex pathways enhances muscle excitability[15] - was supported by the findings of Shakeri et al., who reported that kinesiology taping (KT) increased quadriceps muscle strength[16].

Creep, indicated by the deformation-to-recovery time ratio, reflects the skin's overall viscoelastic properties[17]. Previous research has shown that faster tissue recovery to its initial state (smaller mechanical stress relaxation time values) corresponds to smaller creep values[18]. For muscles, smaller creep parameter values are associated with healthy, younger tissues[18]. The facial muscles are also skeletal muscles and show changes similar to those of the skeletal muscles of the limbs and trunk[19]. Kim et al.[6] and Van Lieshout et al.[7] both reported that facial exercises and progressive resistance exercises of facial expression muscles, respectively, led to increased muscle strength and reduced biomechanical extensibility. This resulted in shorter muscles and firmer, more elastic skin, establishing a direct correlation between improved muscle strength and enhanced skin elasticity. Additionally, when applied to the face, KT can help restore the functionality of facial expression muscles by providing gentle support and facilitating normal muscle movements[12]. Di Stadio et al.[11] described facial taping as biofeedback, allowing patients to be aware of their movement during rehabilitation through the stimulation of skin receptors for touch and pressure/tension. This awareness contributes to improvements in muscle functionality and coordination. However, to our knowledge, no study has reported improvements in skin elasticity and wrinkles through the promotion of tissue creep using KT's tension to lift sagging skin against gravitational force. Hence, this study aims to explore the impact of KT on facial skin among elderly women, with a specific focus on skin elasticity, sagging, and wrinkles.

Materials and Methods

Participants

The study recruited 12 healthy adult women, but only 10 completed the study. All participants were fully informed about the research purpose and training method before the test started. They voluntarily participated in the study after being thoroughly briefed on the risks and advantages of the program and provided a written informed consent. The research protocol was approved by the Institutional Research Committee of Dankook University (DKU 2022-03-018).

The inclusion criteria were as follows: (1) Wrinkles due to aging; (2) Women with facial nasolabial wrinkles; (3) No history of tape allergy; (4) Participants without facial paralysis or facial neuritis. The exclusion criteria were as follows: (1) Facial skin interventions, such as lasers, Botox injections, dermal fillers, or thread carvings, performed in the past three years; (2) A history of facial plastic surgery involving the nose, eye corners, and jaw in the past three years; (3) Individuals with signs of allergy or discomfort with KT.

Procedures

This open-label, prospective study instructed participants to minimize factors that could potentially influence results during the intervention period, such as undergoing specialized dermatological treatments, using functional cosmetics, or prolonged exposure to sunlight. Each participant applied KT tape to five facial areas (forehead (FH), left eye corner (CEL), right eye corner (CER), left nasolabial fold (NL), and right nasolabial fold (NR)) for 20 minutes, three times a week, over four weeks.

Before applying Kinesio Tape (KT), we used sweet almond oil to perform a facial massage. This not only improved the skin's ability to retain moisture, but also soothed the skin after the application of KT, preventing potential skin damage from the elastic tape. The length of the KT was determined based on the participants' anthropometric measurements. To target the muscles associated with glabellar frown lines, forehead lines, nasolabial folds, and crow's feet around the eyes, we selected specific tape cutting shapes.

For Forehead Lines: In this study, we applied I-shaped KT with 10% tension vertically from left to right across specific facial areas. This tension level, determined through preliminary studies using anthropometric measurements, was chosen to provide a moderate lifting effect without excessive strain on the skin.

By maintaining a 10% stretch, we aimed to promote subtle skin movement and facilitate tissue support while minimizing discomfort. The starting points were positioned just above the center of the eyebrows, extending against gravitational force, with the endpoint being the frontalis muscle. The lengths were 5 cm, 7 cm, and 5 cm, with a width of 1.5 cm.

For Glabellar Frown Lines: We used I-shaped KT with 10% tension, attached to the root of the nose, with a length of 7 cm and a width of 1.5 cm. The tape was applied vertically in the anti-gravitational direction, with the endpoint being the frontalis muscle.

For Nasolabial Folds: Claw-shaped KT was employed, divided into three sections (upper, middle, lower), each with 10% tension. The starting point was at the zygomatic arch, with a length of 8 cm and a width of 2 cm for each section. The upper section stretched from the nose alar to the zygomatic arch, the middle section was positioned 1 cm above the corner of the mouth to the zygomatic arch, and the lower section was placed 1 cm below the corner of the mouth, extending in the anti-gravitational direction to the zygomatic arch.

For Crow's Feet Lines: We used I-shaped KT with 10% tension, a length of 10 cm, and a width of 1.5 cm. The starting point was from the inner part of the eye to the outer part of the eye, always following the anti-gravitational direction, with the endpoint fixed on the muscle above the eyebrow (Figure 1). A drawing was used in Figure 1 instead of a photo to respect the participant's privacy, as they were reluctant to share their photo.

Figure 1. Kinesio taping attachment sites on the front and side of the face.

Clinical assessment

The primary endpoint for assessing treatment effectiveness was the improvement in skin elasticity, measured through cutometry parameters. The effectiveness of the treatment was assessed using cutometric measurements and photographic documentation. The Cutometer MPA 580 (Courage + Khazaka electronic GmbH, Germany), which measures skin elasticity, operates based on a suction method. A hollow probe applies negative pressure to stretch the skin, while optical measurement detects the skin's lift displacement. To ensure consistency in the application of negative pressure and probe positioning across participants, specific guidelines were followed. A measurement probe with a 2 mm orifice was used, applying a negative pressure of 450 mbar in a cycle of 2 seconds of inhalation followed by 2 seconds of relaxation, repeated for 10 cycles. Measurements were conducted under standardized conditions with a temperature of 24 ± 2°C and relative humidity of 40 ± 2%. Before measurements, the test site was cleaned and allowed to acclimate for 30 minutes to ensure uniform skin conditions across participants. Skin assessments were performed three times each on specific facial areas: the forehead, between the eyebrows, around the corners of the eyes, and on the cheeks, ensuring comprehensive data on skin elasticity.

We selected cutometer parameters based on previous studies to measure skin elasticity, including R2, R5, R7, and R0[20,21]. The R0 parameter corresponds to U(f), representing skin firmness. The R2 parameter is the ratio of complete relaxation and penetration immediately after suction. The R5 parameter is the ratio of the elastic part of the suction phase and immediate recovery during the relaxation phase. The R7 parameter is the ratio of the elastic part of the suction phase and the maximum penetration immediately after suction. Parameters R2, R5, and R7 are linked to skin elasticity, with values closer to 1 (100%) indicating more elastic skin post-intervention. Additionally, identical regions of interest (ROI) measuring 4 cm in length and 4 cm in width were compared pre- and post-intervention using ANTERA3D® (Miravex, Ireland), which provides a qualitative and quantitative analysis of wrinkles and texture. All measurements were performed in the

same room without sunlight under controlled environmental conditions (23.4 ± 1.1°C, 29.3% ± 12.0% relative humidity). All participants sat in the same chair in front of the same gray background and did not wear any makeup.

Two beauty experts (department professors) independently conducted a blind assessment of the Wrinkle Severity Rating Scale (WSRS) by evaluating pairs of photographs taken at baseline and 4 weeks later. To ensure objectivity and minimize bias in the WSRS evaluation, the experts were not informed of the chronological order of the photos (baseline vs. 4 weeks). Their combined assessments yielded the average score used for analysis. The WSRS employs a 5-point scale: 1 = none, 2 = mild, 3 = moderate, 4 = severe, 5 = very severe skin wrinkling.

The self-satisfaction questionnaire results after the KT intervention are crucial due to the subjective nature of opinions regarding any improvements to the skin's appearance. Participants independently provided these ratings through questionnaires, answering questions without any external influence. This satisfaction scale was administered at the end of the 4-week intervention, posing the question: "What changed after the KT treatment?".

Statistical analysis

Data analysis was conducted using SPSS Statistics for Windows, version 25.0 (SPSS Inc., Chicago, Illinois, USA). Descriptive statistics were calculated to determine the mean and standard deviation of the participants' general characteristics. The Shapiro-Wilk test was used to assess normal distribution. For normally distributed data, the T-test was applied to compare measurements before and after the intervention. For data that did not follow a normal distribution, the Wilcoxon Signed Rank Test was used. Specifically, the analysis of facial skin elasticity before and after the intervention employed the T-test, while the evaluation of the WSRS scale before and after the intervention used the Wilcoxon Signed Rank Test. The significance level for all statistical tests was set at $p = 0.05$.

Results

General characteristics of the participants

The 10 female participants had an average age of 63.40 ± 5.44 years, an average weight of 60.00 ± 5.60 kg, and an average height of 154.55 ± 1.83 cm, as shown in Table 1, which presents the general characteristics of the study subjects.

Results of skin elasticity, measured by cutometer

Following the procedure, the R0 parameter decreased in the CEL, NR, and NL regions, with a significant reduction observed in NR ($p < 0.01$) and NL ($p < 0.05$). In the FH region, the R2, R5, and R7 values increased after the procedure compared to before ($p < 0.05$), with a particularly significant increase in the R7 parameter. Similarly, in the CER area, the R2, R5, and R7 values increased post-intervention, and there was a significant difference in the R7 data before and after the test ($p < 0.05$). In the CEL area, while the R2, R5, and R7 values were higher after the intervention, these differences were not statistically significant compared to the pre-test data. In the NR area, the R2, R5, and R7 values increased post-intervention, with significant increases in the R2 and R7 parameters ($p < 0.05$). Finally, in the NL area, the R2, R5, and R7 values also increased after the intervention, with a significant increase noted in the R7 parameter ($p < 0.01$) (Figure 2). It is important to note that the manufacturer's stated measurement error of ±3% was accounted for in our analysis. Despite this margin of error, the results, particularly for the R2 and R7 parameters, remained

Table 1. General characteristics of the participants.

Variables	Mean±SD
Age (year)	63.40±5.44
Weight (kg)	60.00±5.60
Height (cm)	154.55±1.83

Total number of participants: 10 (n = 10), Values represent mean ± standard deviation.

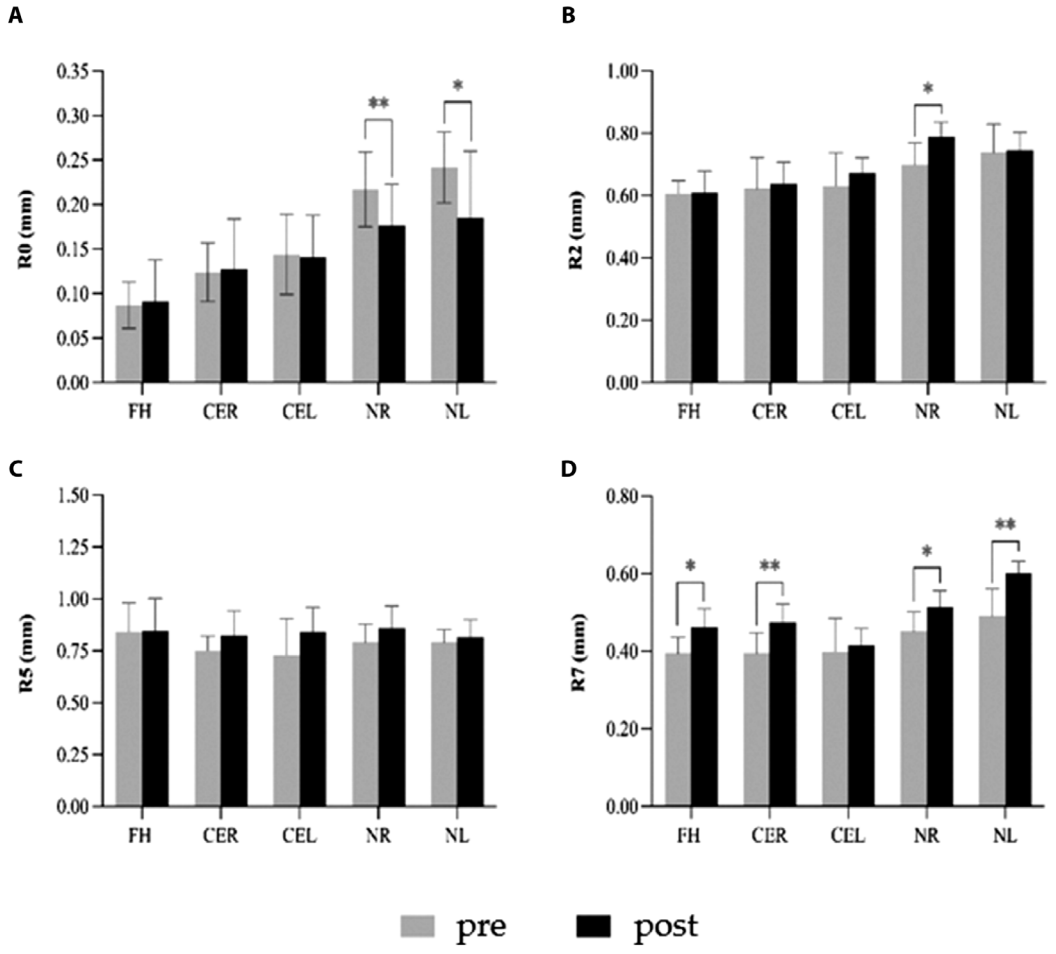

Figure 2. R parameter values for all measurement sites before and after the intervention (* $p < 0.05$, ** $p < 0.01$).

statistically significant, although close to the threshold of significance. This indicates that while the findings are noteworthy, they should be interpreted with caution, considering the potential impact of measurement errors on the statistical significance.

Wrinkle severity rating scale results after KT intervention

Table 2 presents the wrinkle severity rating scale scores for the five locations before and after the procedure. The wrinkle severity rating scale scores were measured on a 5-point scale using a pair of photographs taken before and after the intervention. At the FH, CER, and NL sites, the scores decreased after the procedure; however, these changes were not statistically significant ($P > 0.05$). However, the NR score decreased significantly ($P < 0.05$). The CEL site score remained unchanged before and after the intervention.

Self-satisfaction questionnaire results after KT intervention

Participants could select from five options on the Self-Satisfaction Questionnaire. Of all participants, 80% selected 'improved', while the remaining 20% chose 'no change.'

Table 2. Comparison of Wrinkle Severity Rating Scale Scores Pre- and Post-Intervention.

	Pre-test	Post-test	Z	p-value
FH	1.600±0.699	1.500±0.707	-1.000	0.317
CER	1.200±0.422	1.000±0.000	-1.414	0.157
CEL	1.100±0.316	1.100±0.316	.0000	1.000
NR	1.450±0.438	1.250±0.425	-2.000	0.046*
NL	0.850±0.412	0.800±0.350	-.5770	0.564

Safety monitoring

In response to the reviewer's inquiry about safety data, we would like to clarify that while our study did not formally assess safety indicators, we closely monitored participants for adverse events during the KT intervention. We found no serious complications reported. Future studies need to benefit from a more comprehensive safety assessment to enhance our understanding of the intervention's overall impact.

Discussion

In this study, we investigated the effects of using KT in an anti-gravitational direction to five facial sites - FH, CER, CEL, NR, and NL - over a 4-week period. After the intervention, we observed a decrease in R0, particularly in NR and NL. The R2 parameter exhibited a significant increase in NR, while R5 displayed a general upward trend across all areas, though not statistically significant. Notably, R7 values increased in FH, CER, NR, and NL.

He et al.[22] explored the biomechanical effects of KT by examining the interaction between the tape and the skin to uncover potential functional mechanisms. They applied KT to the thigh area to study skin deformation during knee flexion and extension, finding that natural tension taping with I-tape shortened the skin between the ends of the tape. Therefore, in our study, where KT tension was applied at 10% greater than natural tension, we believe that sagging skin was lifted, thereby enhancing skin elasticity and firmness. Another study using MRI analysis found that KT's mechanical effects extended beyond the taped area to impact adjacent tissues[23]. Consequently, our findings suggest that the application of KT may contribute to the improvement of skin elasticity.

Skin elasticity is a key indicator of skin aging[24]. The R0 (U[f]) parameter represents skin firmness, with smaller R0 values indicating tighter skin[25]. The R7 parameter, reflecting the ratio of immediate retraction to final distension in the first vacuum period, shows the most substantial negative correlation with age among the R parameters related to skin elasticity[26]. This suggests that the R7 parameter is a crucial indicator for measuring skin aging based on elasticity. Previous research has shown that facial muscle strength increases while biomechanical extensibility of facial skin decreases after just eight weeks of progressive resistance training[6]. This supports the link between enhanced skin elasticity and increased facial muscle strength, leading to firmer and more resilient skin. Research by Kawałkiewicz et al.[24] and Ryu et al.[26] highlighted that the negative correlation between the R7 parameter and age is more pronounced than for parameters R2 and R5. In contrast, the R0 parameter does not vary with age. Therefore, the R7 parameter is essential for evaluating facial skin elasticity[24,26]. Our results show a statistically significant increase in R7 values in four areas. However, the increase in CEL after KT intervention was not statistically significant. This lack of significance might be due to natural asymmetries in the human body[27], which contribute to age-related changes such as asymmetrical facial features, wrinkles, and sagging[28]. Factors such as sleeping habits, sun exposure, and muscle weakness can lead to the asymmetric aging of the face[28]. Additionally, asymmetric viscoelasticity in facial skin has been observed in postmenopausal women[29].

The Wrinkle Severity Rating Scale scores decreased in the FH, CER, and NL areas after the intervention, but these changes were not statistically significant. The NR area showed the most significant improvement in nasolabial folds. Moreover, 80% of participants reported improved skin in the self-satisfaction questionnaire. While this positive feedback is encouraging, we recognize that self-reported measures can be subjective and influenced by biases. To minimize the social desirability bias, we ensured anonymity in responses, though expectations and motivations may

still affect results. Skin hysteresis, strongly linked to wrinkle formation[30], was not considered in this study. As there are no prior studies on KT for facial rejuvenation, comparing our results with others is not possible.

There are several limitations to this study. The relatively small sample size and short intervention period may have hindered the detection of significant effects for some parameters. The absence of a control group also limited our ability to assess whether the moisturizer contributed to wrinkles, impacting the evaluation of KT's true effect. Although we encouraged participants to avoid excessive drinking, smoking, and sun exposure, these factors were not rigorously controlled. Additionally, we did not measure skin thickness, environmental exposure, or collagen levels, which could influence the response to KT in different facial regions. Despite these limitations, this study offers valuable insights into the effects of kinesiology tape (KT) applied in an anti-gravitationl direction to five facial sites over four weeks. Significant reductions in wrinkle parameters, especially in the nasolabial areas, were observed, alongside an increase in the crucial R7 indicator of skin elasticity. Additionally, positive self-reported outcomes from 80% of participants support the potential efficacy of KT for improving skin appearance. This research contributes to the emerging literature on KT in facial rejuvenation and sets the stage for future investigations in this area.

Conclusions

In this pioneering study, we investigated the impact of a 4-week KT intervention on facial wrinkles, skin sagging, and elasticity among elderly women. Our findings highlight the significant enhancement of the crucial R7 parameter in the FH, CER, NL, and NR sites. This supports a confident recommendation for KT as an effective non-invasive method to improve skin elasticity in elderly women with sagging skin.

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Conflicts of Interest: The authors declare no conflicts of interest.

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