Non-Traditional and Non-Invasive Approaches in Facial Rejuvenation: A Brief Review

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Abstract: While injectables, lasers, and surgical interventions have traditionally been used to reverse the changes associated with facial aging, other alternative therapies such as facial acupuncture and facial exercises are now being studied for facial rejuvenation. In this paper, we both summarize the concepts of facial acupuncture and facial exercises, and review seven studies that evaluate the efficacy of these modalities. Data from these studies suggest that both facial acupuncture and facial exercises have the potential to improve the skin laxity, wrinkle length, muscle thickness, and pigmentary changes associated with aging. Patients frequently reported improvement and experienced very few side effects. However, further research is necessary before these modalities are widely accepted as effective by the medical community, though the results of these studies may ultimately make providers less hesitant when patients seek out these services.

Keywords: photoaging; facial rejuvenation; facial acupuncture; facial exercises

1. Introduction

As per a recent survey performed by the American Society of Dermatologic Surgery in 2019, nearly 70% of patients reported considering a cosmetic procedure, which is an increase from just 50% of patients in 2015 [1]. Of those participating in the 2019 survey, 70% of patients report seeking cosmetic procedures to either improve skin discoloration and texture, or lines and wrinkles around the eyes [1]. These changes are primarily a result of chronic sun exposure, though other factors such as subcutaneous fat loss and environmental exposures are said to contribute [2–4]. Ultraviolet light directly damages collagen and elastic fibers, which in turn leads to increased skin laxity and the formation of rhytides such as nasolabial folds and marionette lines [2–4]. Pigmentary changes are also associated with cumulative ultraviolet light exposure, leading to the formation of solar lentigines, telangiectases, and overall dyschromia [2]. The redistribution of subcutaneous fat in the face overtime further accentuates these changes [2].

Several invasive and minimally invasive modalities are available for reversing the above changes associated with facial aging. Invasive methods used for facial rejuvenation most often include aesthetic plastic surgery, which serves to create the outward appearance of youth but does little to address or prevent the underlying causes of facial aging [5,6]. In contrast, noninvasive approaches may be

sought as either complementary to, or an alternative to, invasive methods of facial rejuvenation. Some noninvasive approaches frequently described in the literature include botulinum toxin to improve the appearance of rhytides, dermal fillers, and laser resurfacing. However, other non-traditional, noninvasive approaches, such as facial acupuncture and facial exercises, are also used despite the lack of robust research or randomized controlled trials on these modalities.

The principles of acupuncture were first developed by monks in ancient China and later became known as Qi (pronounced "chee"), which is the energy responsible for all movement and transformation in the universe [6–8]. Qi is divided into two parts, yin and yang. Acupuncture needles are inserted into the yin and yang channels to restore the internal balance of yin and yang through either toning or relaxing certain target areas [6,7]. Increased skin laxity, for example, would be targeted by inserting needles along a channel for toning. Several theories exist as to how acupuncture works. The endorphin model proposes that acupuncture needles inserted into specific points stimulate the production of endogenous opioids, and pre-treatment with naloxone decreases the overall pain-alleviating effects of acupuncture [8,9]. Other theories suggest that the increased electrical conductivity of tissue at the acupuncture sites results in increased circulation to the area [6,8].

Facial exercises involve a variety of strengthening movements and manipulations of facial muscles for rejuvenation. This non-invasive approach aims to strengthen facial muscle tone, thereby reducing sagging skin of the face [10]. It has been proposed that facial exercising aids in tissue regeneration by increasing circulation to the facial muscles and allowing for drainage of generated waste products [11]. The goal of facial exercising is to combat the multitude of underlying processes that cause wrinkling and skin laxity, including hormone level changes, muscle atrophy, and redistribution of subcutaneous fat [12].

Considering the growing number of patients seeking cosmetic procedures, we intend to provide a brief review of recent literature concerning the effectiveness, advantages, and disadvantages of facial acupuncture and facial exercises for facial rejuvenation.

2. Materials and Methods

A literature search was conducted using PubMed, Science Direct, and ClinicalKey without placing date restrictions. The following keywords were utilized: "photoaging," "facial aging," "acupuncture and facial rejuvenation," and "facial exercises." An additional search using a University library and Google Scholar was completed to be fully inclusive of pertinent research studies. Studies were considered eligible for this review based on the following inclusion criteria: (1) use of experimental design; (2) performance of facial acupuncture with quantitatively measured results; (3) performance of facial exercises with quantitatively measured results; (4) were English language literature published in a peer-reviewed journal; and (5) seminal research carried out within the last 10 years. Meta-analyses and review papers were excluded from our search. Two independent reviewers (T.F. and A.M.S) completed the previous methods separately and subsequently cross-referenced searches to further assure that no pertinent studies had been excluded from the search. Any disagreements between the two reviewers were discussed and resolved.

The papers retrieved were then combined and duplicates were excluded. A preliminary assessment of the titles and abstracts of each paper was performed, and those deemed not eligible based on the aforementioned inclusion criteria were excluded. The remaining articles underwent a full-text review with special attention also paid to the reference lists of these articles for additional relevant studies.

Collectively, 46 studies were identified through the electronic search. After removing duplicates and irrelevant studies, 29 studies remained. From the remaining studies, application of exclusion and inclusion criteria yielded a total of eight studies which were submitted to a full-text review. Table 1 details the pertinent findings from each article and is arranged by modality. Table 2 describes the advantages and disadvantages of each modality as described in the articles.

Table 1. Summary of included studies.

First Author, Year, and Location	Modality	Population, Demographics, and Study Design	Description of the Intervention	Salient Findings	Ethical Considerations
Nozomi Donoyama, 2012, and Japan [13]	Acupuncture	Women, $N = 2$, and age = 50 years old (A) and 29 years old (B). Case series	Five consecutive sessions, once weekly, for a total of 1 month. Needles were inserted at 1–3 mm depth and retained for 10 minutes Water content and oil content of the facial skin were measured using Skin Analyzer Clinical Suite 2.1.	After one session: Water content Patient A: 89% to 88% Patient B: 76% to 80% Oil content Patient A: 32% to 42% Patient B: 8% to 40% After all sessions: Water content Patient A: 89% to 87% Patient B: 76% to 80% Oil content Patient A: 32% to 38% Patient B: 8% to 19%	Followed the ethical principles of the Declaration of Helsinki. Written informed consent was obtained from all participants.
Suzane Kavanagh, 2012, and Ireland [12]	Facial exercise	Women, $N = 97$ (51 NMES and 46 control), and Mean age = 43.7 years (range: 38–52 years). Prospective randomized, controlled, partially blinded.	12 weeks' treatment with neuromuscular electrical stimulation (NMES) facial device (20 min/day, 5 days/week). Ultrasonography of the zygomatic major muscle was performed at weeks 0, 6, and 12 to determine muscle thickness.	Participants who received NMES reported subjective improvement in tone, firmness, radiance, and complexion compared to baseline ($p < 0.001$). After 12 weeks of NMES, the zygomatic major muscle thickness increased 18.7% from the baseline. The difference in muscle thickness between NMES and control groups after 12 weeks was statistically significant ($p < 0.001$).	Followed the International Committee on Harmonization Good Clinical Practice guidelines and the revised version of the Declaration of Helsinki. Approval was obtained by the Galway Regional Hospitals Research Ethics Committee. Written informed consent was obtained from all participants.
Younghee Yun, 2013, and Korea [14]	Acupuncture	Women, $N = 27$, and Mean age = 50.04 ± 6.07 years (range: 40 - 59 years). Single-arm, prospective, open label.	Five facial cosmetic acupuncture (FCA) treatment sessions over three weeks. Contour lines on the face were created using a Moire topography system. Pictures were taken before and after treatment to evaluate improvement, on a scale of 1–5, of these designated contour lines. Participants were also asked to assess the degree of facial elasticity, using a visual analog scale.	15 participants saw at least single level improvement in Moire topography (on a scale of 1–5) after FCA, while 12 patients saw no change. The Mean change in topography was significant ($p < 0.0001$) after FCA. No significant difference was reported in the self-assessment of skin elasticity.	Followed the International Committee on Harmonization Good Clinical Practice guidelines and the revised version of the Declaration of Helsinki. Approval was obtained by the Institutional Review Board of Kyung Hee University Hospital at Gangdong. Written informed consent was obtained from all participants.
Marie-Camille De Vos, 2014, and Belgium [10]	Facial exercise	Women, $N = 18$ (9 experimental and 9 control), Mean age of experimental = 47 years (range: 40 - 55 years), and Mean age of control = 46 years (range: 39 - 60 years). Controlled trial, randomization not performed.	A training session was held for participants to learn four targeted facial exercises. These exercises were then performed daily for 7 weeks. Areas of interest to evaluate included the forehead, the nasolabial folds, the area above the upper lip, the jawline and the area under the chin. Both external evaluators and participants were asked to evaluate the following: (1) side by side photographs of the areas of interest before and after exercise period. They were to choose which one appeared younger or if they both appeared the same age. (2) 36 randomized photographs showing each area of interest, using two visual analog scales.	For the forehead, nasolabial folds, and the area under the chin, the picture before therapy and the option 'both the same age' were chosen more often than the picture after therapy. Only for the upper lip did external evaluators more frequently choose the picture after therapy as appearing younger ($p = 0.004$). Participants chose 'younger' only for the appearance of the jawline after therapy ($p = 0.039$).	Approval was obtained by the ethics committee of Ghent University Hospital.

Table 1. *Cont.*

First Author, Year, and Location	Modality	Population, Demographics, and Study Design	Description of the Intervention	Salient Findings	Ethical Considerations
Jin Hyong Cho, 2015, and Korea [15]	Acupuncture	Women and men though number of each not specified, $N = 107$ (age range: 20s – 70s). Single-arm, prospective, open-label.	Participants completed acupuncture sessions targeting the nasolabial folds (NLs) and eye wrinkles (EW). Photographs were taken at baseline and followed up one to six months after treatment. They were analyzed using DermaVision.	DermaVision analysis of the right and left nasolabial folds, as well as the right and left eye wrinkles, showed a statistically significant decrease in wrinkle size after treatment for all age ranges (p <0.001).	Not reported
Lakkana Rerksuppaphol, 2016, and Thailand [16]	Acupuncture	Women, $N = 41$ (20 facial only and 21 facial/body), and Mean age = 43.9 ± 7.9 years. Randomized clinical trial, no control group present.	Participants completed 2 sessions per week for a total of 8 weeks. Melasma pigment darkness before and after treatment was assessed using a melasma pigment shading scale that ranged from 0 units (black color) to 255 units (white color). Melasma area before and after treatment was also measured.	The melasma pigment shading scale decreased by 3.1 units ($p = 0.002$) for those that were treated with facial acupuncture only. There was no statistically significant decrease in melasma pigment for those who received both facial and body acupuncture. Participants experienced a mean area reduction in their melasma of 2.4 cm^2 ($p < 0.001$) and 2.6 cm^2 ($p < 0.001$) after receiving facial or facial and body acupuncture respectively.	Followed the ethical principles of the Declaration of Helsinki. Approval was obtained from the human research ethics committee of Srinakharinwirot University, Thailand. Written informed consent was obtained from all participants.
Ui-jae Hwang, 2018, and Korea [11]	Facial exercise	Women, $N = 50$, and Mean age = 40.0 ± 10.0 years (range: 30-63 years) Single-arm, prospective, open label	Facial muscle exercises were performed (FMEuP) using the Pao device to train the muscles surrounding the mouth. FMEuP was performed twice a day for 30 seconds for 8 weeks. Facial muscle tone and cross-sectional area (CSA) were measured by sonography. Wrinkle severity was assessed using the Wrinkle Severity Rating Scale (WSRS) (1 = absent to 5 = extreme). Wrinkles and jawline sagging were also assessed using the Face Visual Scale (FVS) (0 = very good to 10 = very poor).	The CSA of the zygomaticus major muscle increased significantly on both sides (right: $p < 0.001$, left: $p = 0.015$). The CSA of the digastric muscle was also significantly increased (right: $p = 0.003$, left: $p = 0.001$). The CSA of the orbicularis oris muscle increased significantly only on the left side ($p = 0.019$). The WSRS showed that participants perceived a statistically significant decrease in wrinkle severity after FMEuP ($p = 0.025$). The FVS showed that participants perceived a statistically significant decrease in the severity of their wrinkles and jawline sagging ($p < 0.001$).	Approval was obtained by the Yonsei University Wonju Institutional Review Board. Written informed consent was obtained from all participants.
Murad Alam, 2018, and United States [17]	Facial exercise	Women, $N = 16$, Mean age = 53.7 (range: 40 - 65 years). Single-arm, prospective, open label.	Participants completed two live 90-minute muscle-resistant facial exercise training sessions. They were asked to perform daily 30-minute exercises for a total of 8 weeks. For weeks 9–20, facial exercises were performed every other day (3–4 times per week). Two blinded physicians scored photographs of the participants using the Merz-Carruthers Facial Aging Photoscale (MCFAP) at baseline, week 8, and week 20. The two blinded physicians were also asked to estimate the participants' ages before and after therapy.	MCFAP showed a statistically significant increase in the upper ($p = 0.003$) and lower cheek ($p = 0.003$) fullness at week 20 when compared to the baseline. Participants reported being overall more satisfied with all facial aging outcomes when compared to the baseline. Evaluators' perceptions of mean participant age went from 50.8 years at baseline to 48.1 years at 20 weeks ($p = 0.002$).	Approval was obtained by the Northwestern University Institutional Review Board. Written informed consent was obtained from all participants.

Table 2. Reported advantages and disadvantages of each modality.

Modality	Advantages	Disadvantages and Adverse Events
Facial acupuncture	Increase in skin oil content [13] Performed by hand, so can be used more readily on sensitive or narrow areas not amenable to certain instruments [15] Decrease in size of nasolabial folds and eye wrinkles [15] Decrease in overall melasma area and pigment darkness [16]	Bruising, edema, pain at needle site [14] Foreign body granuloma [18,19] Atypical mycobacterium infection [20,21]
Facial exercises	Decrease in self-reported severity of wrinkles and jawline sagging [11] Increase in muscle thickness and cross-sectional area [11,12] Increase in physician-rated upper and lower cheek fullness [17]	Potential to cause dynamic rhytides [10] No other adverse events reported in the literature

3. Results and Discussion

A total of eight studies were reviewed, four of which involved facial acupuncture and four involving facial exercises [10–17]. The countries represented in the studies involving acupuncture include Korea ($n = 2$), Thailand ($n = 1$), and Japan ($n = 1$). The countries represented in the studies involving facial exercises include the United States ($n = 1$), Belgium ($n = 1$), Ireland ($n = 1$), and Korea ($n = 1$). The mean age of participants receiving facial acupuncture was 46.8, whereas the mean age of participants performing facial exercises was 46.1. The majority of facial acupuncture studies included female patients only, with the exception being the study by Cho et al., which did not specify the age or gender of each participant, but did report data from male subjects [15]. All four of the facial exercise studies included female participants only. Seven of the studies took ethical considerations into account, but the remaining study by Cho et al. on facial acupuncture did not explicitly mention the process of ethics approval or written informed consent by patients [15].

Of the four studies reviewed on facial acupuncture, only one study assessed the patients' perception of improved skin elasticity. None of the patients in this study attributed the intervention of facial cosmetic acupuncture to improving their skin elasticity [14]. However, objective measurement using Moire topography criteria showed a statistically significant change in topography ($p < 0.0001$), with 55% of patients showing single-level improvement [14]. Each of the three remaining studies had different primary endpoints. In the study performed by Rerksuppaphol et al., the melasma pigment shading scale decreased by 3.1 units ($p = 0.002$), for patients receiving facial acupuncture only. Additionally, both the facial acupuncture only and the facial plus body acupuncture groups experienced a mean area reduction of 2.4 cm^2 and 2.6 cm^2 respectively ($p < 0.001$) [16]. The only study to measure the length of rhytides before and after acupuncture was performed by Cho et al. and showed a statistically significant decrease in the length of the left and right nasolabial folds and eye wrinkles for all age ranges included in the study [15]. The remaining study was a case series performed by Donoyama et al. to assess changes in water and oil content after five consecutive acupuncture treatments [13]. While water content for both the 50-year-old patient (A) and 29-year-old patient (B) was essentially unchanged, the oil content for patient A increased from 32% to 38%, and the oil content for patient B increased from 8% to 19% [13]. No statistical analysis was performed in this study. Given that each study looking at facial acupuncture had a slightly different patient population and primary endpoint, a unifying statement, regarding the results for facial acupuncture as it relates to facial rejuvenation, is difficult to make.

In the studies looking at facial exercises for facial rejuvenation, two of the four studies reviewed were completed using devices. One study utilized the Pao device which was made in Japan and is held in the mouth while nodding the head to train the muscles around the mouth [11]. The other study incorporated a neuromuscular electrical stimulation device that works by delivering an electric current to the muscle and thus causing repetitive muscle contraction [12]. Of the studies that used assist devices, quantitative measurements showed improved thickness and cross-sectional area of the muscles in the face. Additionally, patients' perceptions of their wrinkle severity, tone, firmness, radiance, and complexion improved following intervention with device-assisted facial muscle exercises [11,12]. The remaining studies did not use an exercise device, but rather provided patients with a therapy session to learn facial muscle exercises. In the study performed by De Vos et al., four isometric exercises were

performed daily for seven weeks to target the frontalis, orbicularis oris, zygomatic minor, masseter, sternocleidomastoid, and the mylohyoid muscles [10]. The qualitative results from this study were less generalizable, as both external and self-evaluation of photographic results showed statistically significant improvement, in the upper lip and jawline only [10]. The remaining study by Alam et al., assessment by two blinded physicians using the Merz-Carruthers Facial Aging Photoscale (MCFAP), showed a statistically significant increase in upper (p = 0.003) and lower cheek (p = 0.003) fullness after completion of a 20-week facial exercise program, when compared to the baseline [17]. Overall, the data from these studies show the subjective improvement of facial aging changes which, when measured quantitatively, are complemented by increased muscle thickness.

Based on the studies that were analyzed, the quantitative results suggest that both facial acupuncture and facial exercises have the potential to affect facial aging. Additionally, patients and physician evaluators most often reported improvement in facial appearance or no change, rather than reporting worsening of their appearance. No adverse effects were reported in the facial exercise studies, and the facial acupuncture studies reported only minor bruising and pain. Furthermore, these modalities are inexpensive and offer a more cost-effective option for patients seeking facial rejuvenation. Facial exercises are a self-help approach and can be done at home, without the necessity of involving anyone else, and not requiring any cost. With regards to the implementation of these methods in their medical practice, most physicians would require further education and training on these topics. However, these results might ultimately make physicians less hesitant to refer patients to providers who offer these services.

More robust research should be conducted using facial exercises and acupuncture, particularly using larger sample sizes and within various age groups. The average sample size was $N = 45$, with a range of $N = 2$ to $N = 107$. The small sample sizes included in these studies prevent the generalizability of any statistically significant findings. Incorporating patients > 60 years of age would help to solidify the usefulness of both modalities in reversing the changes associated with facial aging. The addition of patients < 30 years of age would also be beneficial for determining the role of these modalities in the prevention of facial aging. More male participants should be included in future studies, as they too seek out prevention and reversal of facial aging changes. Several of the studies also included used non-randomized control designs, which may have resulted in treatment bias, and emphasizes the need for randomized controlled trial designs in future studies. It is also difficult to reach definitive conclusions using the current literature, given that each study uses different assessment scales and measurements. Further studies should, therefore, try to incorporate standardized measurement to strengthen conclusions being made from these studies and making the meta-analysis of data feasible.

4. Limitations

This review is associated with some limitations. The studies included were written in English language only and found only in peer-reviewed journal publications that were electronically available. There were several other studies written in Korean, Chinese, and Japanese literature that were found during the process of searching for publications that could not be used, which is a limitation of this review. Article selection of this nature leads to an unknown degree of publication bias. Furthermore, many of the experiments involved subjects' responses. Given that the improvement of facial appearance was a primary endpoint and known to participants, the use of such qualitative measures may have led to recall bias. Additionally, these studies likely attracted a specific population more willing to seek out various methods for facial rejuvenation.

For the studies included, the tools and assessments lack reliability and consistency, which constrains the external validity of the data from these studies. If consistent exercise tools were implemented vastly among people, this would allow for more validity and opportunity to assess the benefits of these exercises and tools on facial rejuvenation. Another limitation of this review is the lack of control groups in the studies included. None of the trials involving facial acupuncture had a control group, and only one of the facial exercise studies by Kavanagh et al. had a control group [12]. Given the

lack of controlled trials available for these modalities, it is important to exercise caution in interpreting their effectiveness. This echoes the reality that this review is brief and not a scoping, systematic review. Definitive claims about the effectiveness of either facial acupuncture or facial exercises in treating facial aging cannot be substantiated based on the data presented in this review.

5. Conclusions

In recent years, alternative therapies have been developed to use in addition to or exclusive of traditional injectables, lasers, and surgical interventions for facial rejuvenation. Of these alternative therapies, facial acupuncture and facial exercises have been most studied, though research is still lacking to be sure of their efficacy. In this review, we included the results of four studies that independently evaluated facial acupuncture for decreasing the length of rhytides, improving skin laxity, and reversing the pigmentary changes associated with aging [13–16]. While statistically significant decreases in the length of nasolabial and mesolabial folds were observed in one study and were desirable outcomes, no other studies to date have used this primary endpoint [15]. The appearance and size of facial melasma after acupuncture also decreased, which might be useful for physicians taking care of patients who are refractory to traditional chemical peels, hydroquinone, retinols, or kojic acid [16]. If patients are seeking even less invasive and less expensive treatments to address the volume changes associated with facial aging, facial exercises might be beneficial. Favorable and statistically significant volume changes around the upper lip, jawline, and cheeks were observed using repeatable isometric exercises, even without the use of a device [10,17]. With some additional cost, a facial exercise device may be helpful in the subjective improvement of wrinkle severity, tone, and complexion [11,12]. However, we believe that further research is needed before these modalities become more broadly accepted by medical professionals.

References

1. American Society of Dermatologic Surgery. ASDS Consumer Survey on Cosmetic Dermatologic Procedures. 2019. Available online: https://www.asds.net/Medical-Professionals/Practice-Resources/ASDS-Consumer-Survey-on-Cosmetic-Dermatologic-Procedures (accessed on 19 January 2020).
2. Wesley, N.O.; Rohrer, T.E. Evaluation of Beauty and the Aging Face. In *Dermatology*, 4th ed.; Bolognia, J.L., Jorizzo, J.L., Rapini, R.P., Eds.; Elsevier: Philadelphia, PA, USA, 2017; Volume 2, pp. 2571–2577.
3. Addor, F.A.S.A. Beyond photoaging: Additional factors involved in the process of skin aging. *Clin. Cosmet. Investig. Dermatol.* **2018**, *11*, 437–443. [CrossRef] [PubMed]
4. Baumann, L. Skin aging and its treatment. *J. Pathol.* **2007**, *211*, 241–251. [CrossRef] [PubMed]
5. Honigman, R.; Castle, D.J. Aging and cosmetic enhancement. *Clin. Interv. Aging* **2006**, *1*, 115–119. [CrossRef] [PubMed]
6. Doran, V.C. An introduction to facial revitalization acupuncture. *Eur. J. Orient. Med.* **2007**, *5*, 4–8.
7. Barrett, J.B. Acupuncture and facial rejuvenation. *Aesthet. Surg. J.* **2005**, *25*, 419–424. [CrossRef] [PubMed]
8. Chon, T.Y.; Lee, M.C. Acupuncture. *Mayo Clin. Proc.* **2013**, *88*, 1141–1146. [CrossRef] [PubMed]
9. Eriksson, S.V.; Lundeberg, T.; Lundeberg, S. Interaction of diazepam and naloxone on acupuncture induced pain relief. *Am. J. Chin. Med.* **1991**, *19*, 1–7. [CrossRef] [PubMed]

10. De Vos, M.; Van Den Brande, H.; Boone, B.; Van Borsel, J. Facial Exercises for Facial Rejuvenation: A Control Group Study. *Folia Phoniatr. Logop.* **2014**, *65*, 117–122. [CrossRef] [PubMed]

11. Hwang, U.; Kwon, O.; Jung, S.; Ahn, S.; Gwak, G. Effect of a Facial Muscle Exercise Device on Facial Rejuvenation. *Aesthet. Surg. J.* **2018**, *38*, 463–476. [PubMed]

12. Kavanagh, S.; Newell, J.; Hennessy, M.; Sadick, N. Use of a neuromuscular electrical stimulation device for facial muscle toning: A randomized, controlled trial. *J. Cosmet. Dermatol.* **2012**, *11*, 261–266. [CrossRef] [PubMed]

13. Donoyama, N.; Kojima, A.; Suoh, S.; Ohkoshi, N. Cosmetic acupuncture to enhance facial skin appearance: A preliminary study. *Acupunct. Med.* **2012**, *30*, 152–153. [CrossRef] [PubMed]

14. Yun, Y.; Kim, S.; Kim, M.; Kim, K.; Park, J.S.; Choi, I. Effect of facial cosmetic acupuncture on facial elasticity: An open-label, single-arm pilot study. *Evid. Based Complement. Altern. Med.* **2013**, *2013*. [CrossRef] [PubMed]

15. Cho, J.H.; Lee, H.J.; Chung, K.J.; Park, B.C.; Chang, M.S.; Park, S.K. Effects of Jae-Seng Acupuncture Treatment on the Improvement of Nasolabial Folds and Eye Wrinkles. *Evid. Based Complement. Altern. Med.* **2015**, *2015*. [CrossRef] [PubMed]

16. Rerksuppaphol, L.; Charoenpong, T.; Rerksuppaphol, S. Randomized clinical trial of facial acupuncture with or without body acupuncture for treatment of melasma. *Complement. Ther. Clin. Pract.* **2016**, *22*, 1–7. [CrossRef] [PubMed]

17. Alam, M.; Walter, A.J.; Geisler, A.; Roongpisuthipong, W.; Sikorski, G.; Tung, R.; Poon, E. Association of Facial Exercise with the Appearance of Aging. *JAMA Dermatol.* **2018**, *154*, 365–367. [CrossRef] [PubMed]

18. Alani, R.M.; Busam, K. Acupuncture granulomas. *J. Am. Acad. Dermatol.* **2001**, *45*, S225–S226. [CrossRef] [PubMed]

19. Bashey, S.; Lee, D.S.; Kim, G. Extensive Facial Sclerosing Lipogranulomatosis as a Complication of Cosmetic Acupuncture. *Dermatol. Surg.* **2015**, *41*, 513–516. [CrossRef] [PubMed]

20. Woo, P.C.; Leung, K.W.; Wong, S.S.; Chong, K.T.; Cheung, E.Y.; Yuen, K.Y. Relatively alcohol-resistant mycobacteria are emerging pathogens in patients receiving acupuncture treatment. *J. Clin. Microbiol.* **2002**, *40*, 1219–1224. [CrossRef] [PubMed]

21. Koh, S.J.; Song, T.; Kang, Y.A.; Choi, J.W.; Chang, K.J.; Chu, C.S.; Jeong, J.G.; Lee, J.-Y.; Song, M.-K.; Sung, H.-Y.; et al. An outbreak of skin and soft tissue infection caused by Mycobacterium abscessus following acupuncture. *Clin. Microbiol. Infect.* **2010**, *16*, 895–901. [CrossRef] [PubMed]