

**Original Research****Different Effect Of Iontoporesis And Massage With The Addition Of Vitamin C Serum On Elasticity Women's Face Skin**Dwi Kurniawati<sup>1\*</sup>, Afrianti Wahyu Widiarti<sup>2</sup><sup>1,2</sup> Department of Physiotherapy, Poltekkes Kemenkes Surakarta**ABSTRACT**

**Background:** Skin aging is the most worrisome problem in women. Preventing skin damage can be done in various ways including using iontophoresis, massage and adding vitamin C serum. The purpose of this study was to determine the difference in the effect of giving Iontophoresis with vitamin C serum and massage with vitamin C serum on the elasticity of women's facial skin.

**Methods:** The type of research used quasi experimental two group pre and post test design carried out in September – October 2021 in 2021 on local women in Tohudan Colomadu Village. In this study, the research subjects were given treatment with a frequency of 2 times a week for 2 weeks. Sived into 2 treatment groups, namely, group 1 was given Iontophoresis with Vitamin C Serum, group 2 was given massage with Vitamin C Serum. The measuring instrument used was a skin analyzer.

**Results:** Test the difference in elasticity values of Group 1 and Group 2 with the Independent Samples Test, the results obtained  $p$  value = 0.015, which means that there is a significant difference in the administration of Iontophoresis and Massage with the addition of Vitamin C Serum on facial skin elasticity in women.

**Conclusion:** Giving Iontophoresis with Vitamin C Serum is more effective than massage with the addition of Vitamin C Serum on facial skin elasticity in women. It is recommended that the administration of vitamin C serum with the iontophoresis method be one of the interventions that can be used to increase facial skin elasticity.

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**INTRODUCTION**

The appearance of the skin, its smoothness, elasticity, color and brightness gives an idea of a person's age. The appearance of facial skin is not only a reflection of skin aging, but also reflects changes due to the effects of extrinsic aging that can make a person look older than his age (Nilforoushzadeh et al., 2018). The aging process is the weakening of cells and organs as a whole starting from adulthood slowly and

developing rapidly starting at the age of 30 years, marked by the body starting to feel pain and wrinkled skin.

Efforts to slow down premature aging caused by free radicals are antioxidants. As an active ingredient, antioxidants are used to protect the skin from oxidation damage and prevent premature aging (Situmorang & Zulham, 2020). Facial skin aging can be the result of a process of damage to the skin structure and a decrease in normal skin function. 97% of skin aging factors are extrinsic, while the remaining 3% are intrinsic factors.

Extrinsic factors closely related to lifestyle such as smoking, excessive alcohol, and nutrition, can also contribute to premature skin aging, therefore it is necessary to further investigate the effect of lifestyle on skin aging (Nabila, Damayanti, Handayani, & Setyaningrum, 2021). Skin aging is one of the most worrying problems for a woman, especially facial skin, the cause of skin aging can be categorized into intrinsic factors chronological and extrinsic (Nabila et al., 2021).

Aging factors are extrinsically related to environmental exposure, health, and lifestyle related to individual habits, such as sun exposure, tobacco use, diet, and exercise. Changes in the skin is one of the important signs of aging (Petruk, Giudice, Rigano, & Monti, 2018). Skin that is exposed to sunlight undergoes changes that result in inflammation, photoaging, and various skin disorders. photoaging of skin with wrinkling, loss of elasticity, increased skin fragility, and slower wound healing (Haerani, Chaerunisa, Yohana, & Subarnas, 2018).

Changes in the dermis of the skin, there is a decrease in the production of sebum and sweat so that the acid mantle formed is reduced, resulting in increased water evaporation (Gu, Han, Jiang, & Zhang, 2020). In addition, there is a reduction in the number and size of collagen and elastin fibers so that the elasticity and elasticity of the skin is reduced. Developments that occur in the epidermal and dermal layers and are mainly related to the degradation of the extracellular matrix (Nilforoushzadeh et al., 2018).

Various medical therapies and topical cosmetics are used to treat or prevent premature aging of the skin. Recent studies have begun to examine the potential of different interventions using manual therapy, faradic currents and iontophoresis (Bakshi, Vora, Hemmady, & Banga, 2020). Iontophoresis with vitamin C serum can penetrate the skin layer of the corneum due to the electromigration process.

Propylene glycol in vitamin C can affect the stratum corneum to intercalate lipids so as to make the structure more dense and membrane permeability coefficient In the Iontophoresis study with Vitamin C Serum conducted by the Faculty of Pharmacy, Padjajaran University, it showed an increase in the penetration of vitamin C by 11.76% into the stratum corneum and increased facial skin turgor (Wathoni & Panji Luhur, 2012).

*Massage or* Facial massage also plays an important role in keeping facial skin health. Facial movements that we do every day, such as chewing, frowning or smiling, actually train facial muscles. Facial muscles also need treatment in order to relax again. Massage on the face can increase blood circulation and increase metabolic processes (Amanati, Purnomo, & Abidin, 2017). Massage can help accelerate the absorption of vitamin C into the skin so that it relaxes facial skin, improves skin health and restores facial elasticity.

Previous studies have examined the effect of giving Iontophoresis with Vitamin C Serum on facial skin elasticity, while in this study the researchers wanted to compare

the two interventions, namely the administration of iontophoresis with vitamin C serum and massage with vitamin C serum on the elasticity of women's facial skin. The purpose of this study was to determine the difference in the effect of iontophoresis with vitamin C serum and massage with vitamin C serum on the elasticity of women's facial skin.

## **MATERIALS AND METHOD**

The type of research used in this study is *quasi experimental two group pre and post test design*, in this study there are two groups. In this study, the research subjects were given treatment with a frequency of 2 times a week for 2 weeks. The study was conducted in September – October 2021. The research population was women in Tohudan Colomadu Village, Karanganyar. The sample in this study were women in Tohudan, Colomadu Village, Karanganyar who met the criteria as many as 30 people.

The sampling technique used is purposive sampling method. The number of samples taken is based on the criteria that have been determined by the researcher. Inclusion criteria included: (1) women aged 30-45 years (2) had no allergy to Vitamin C serum, (3) willing to participate in the research program. Exclusion criteria: (1) had skin diseases such as dermatitis, extensive wounds or systemic disease, (2) research subjects were unable to participate in the research program 3 times in a row.

In this study there are two variables, The independent variables in this study were iontophoresis and massage with serum C. Iontophoresis with serum vitamin C was a galvanic current with low intensity plus vitamin C serum for 5 minutes. Massage with serum C is a massage that is applied for 10 minutes on both sides of the face and neck which begins with the administration of vitamin C serum.

It begins with a stroking motion for 30 seconds, followed by efflurance, finger kneading and tapotement movements, each movement is carried out for 2 minutes then Closing was done with an efflurance movement for 30 seconds. The dependent variable is facial elasticity. Elasticity parameter using the sensor from the skin analyzer has an integrated system to support the diagnosis that not only covers the top layer of skin, but is also able to show the deeper side of the skin layer. You do this by pressing the power button and attaching it to the surface of the facial skin.

The number displayed on the device is the percentage of water content in the skin being measured. Initial data collection includes pre-test when the subject is first collected and given an explanation. The treatment in both groups was carried out after the initial data was collected and given treatment in the first group in the form of Iontophoresis with Vitamin C Serum, and the second group massage with Vitamin C Serum. Post-test data collection was carried out one week after the last treatment from each group.

The data that was recapitulated for the results of measuring the skin elasticity value either before or after treatment was then analyzed statistically with a data normality test to determine whether the data were normally distributed or not. Normality test using *Shapiro-Wilk*. Test the difference in elasticity values between groups one and two using the Independent Samples Test.

The patient had signed an informed consent to conduct the study. Ethical permission was obtained from the Health Research Ethics Commission of Muhammadiyah University of Surakarta with the number: 3745/B.1/KEPK-FKUMS/X/2021.

## **RESULTS**

The subjects in this study were women in Tohudan Colomadu Village, Karanganyar. The number of samples is 30 people. In this study group 1 received treatment iontophoresis with serum vitamin C, group 2 get treatment *massage* with serum vitamin C. This study was conducted 2 times a week for 2 weeks in September – October 2021. The purpose of this study was to determine the difference in the effect of iontophoresis with vitamin C serum and massage with vitamin C serum on the elasticity of women's facial skin.

Based on the characteristics of the respondents in both groups according to age, the dominant age is 30-35 years old by 40%. Judging from the work the majority do not work in group 1 (46.7%), while group 2 (53.3%).

**Table 1.** Characteristics of Respondents

Gender	Group I		Group II	
	Frequency	%	Frequency	%
<b>Age</b>				
30-35	6	40	6	40
36-40	4	26.7	5	33.3
41-45	5	33.3	4	26.7
<b>Work</b>				
Doesn't work	7	46.7	8	53.3
Self-employed	5	33.3	6	40
Government officials	3	20	1	6.7

**Table 2.** Data Analysis Results

Variable	p	Information
<i>Normality test</i>		
Group I Pre	0.290	Normal
Post	0.867	Normal
Group II Pre	0.292	Normal
Post	0.714	Normal
<i>Paired Sample Test</i>		
Group I	0.000	There is a significant difference
Group II	0.018	There is a significant difference
<i>Independent Samples Test</i>	0.015	there is a significant difference

The table above shows the results this research result from normality test of elasticity values for groups I and II obtained p value  $>0.05$ , then for data normally distributed for the different test used parametric test.

In the Paired Sample Test in group I, a significance value of 0.000 was obtained, which means there is a significant difference before and after treatment in the group given in the form of Iontophoresis with Serum Vitamin C. While in group II, a significance value of 0.018 was obtained, which means that there was a significant difference before and after treatment *massage* with Vitamin C Serum.

In the Independent Samples Test, a significance value of 0.015 was obtained, which means that there is a significant difference, so it can be concluded that there is

meaningful difference elasticity value after treatment in group I in the form of giving vitamin C serum by iontophoresis method and group II in the form of giving vitamin C serum with massage. So that this can answer the question of whether there is a difference giving iontophoresis and massage with the addition of vitamin C serum to the elasticity of women's facial skin.

## DISCUSSION

The results of the study in the group that was given iontophoresis and serum vitamin C an increase of 4.6 compared to the group that was given massage and serum vitamin C. In the group that was given massage and serum vitamin C there was also an increase in elasticity but not as much as in the group iontophoresis and serum vitamin C.

*Massage* is a structured series of pressure or touch using the hands on the soft tissues of the body to stimulate sensory receptors and subcutaneous tissue in the skin so that it provides a relaxing effect and can reduce facial stiffness (Amanati et al., 2017). Massage on the skin can increase blood circulation, reduce muscle tension and improve local blood circulation and reduce the level of dryness of the skin (Khorsand et al., 2019).

*Massage* on the face can improve blood circulation and increase metabolic processes. The resulting effect of massage can help accelerate the absorption of vitamin C into the skin so that it relaxes facial skin, improves skin health and restores facial elasticity (Kaushik et al., 2021). In the given *Group massage* and vitamin C serum has limitations in penetrating the corneum layer, so that vitamin C serum cannot be penetrated into skin cells optimally.

*Iontophoresis* work on The principle is like repulsion, pushing charged molecules through the skin. Serum delivery to the skin is delivered intradermally via *iontophoresis* gradually released into circulation to maintain blood concentration after maintaining movement of skin tissue (Fukuta, Oshima, Michiue, Tanaka, & Kogure, 2020). The basic principle of iontophoresis is a current that moves ions, where the poles with the same charge will repel each other, while the poles with different charges will attract each other.

The energy generated by the current conduction can increase the speed of drug penetration through the membrane. Direct current is delivered through a pair of electrodes, one electrode delivers ionizing material, while the other acts as a neutral electrode. When a positively charged ionizing material is subjected to a current through the positive electrode (cathode), then the material will be rapidly delivered to the negative electrode placed on the body. Topical and transdermal iontophoresis allows hydrosoluble molecules to transit the stratum corneum (SC) more quickly and thereby increases the rate and extent of delivery to the epidermis (Gratieri, Zarhloule, Dubey, & Kalia, 2021).

Serum vitamin C plays an important role in increasing collagen production and decreasing the production of matrix metalloproteinases, the enzyme pepsin digests increases dermal degradation. In an in vitro study, each individual's fibroblasts differ according to age. Stimulation of collagen synthesis by vitamin C derivatives (Ascorbic acid) will help improve facial skin elasticity (Al-Niami & Yi Zhen Chiang, 2017).

Iontophoresis with Ser-C is easier to penetrate into the stratum corneum through electromigration iontophoresis technique which only increases the flow of electrically charged molecules. Ser-C has improved the skin's horny layer and lipids, which makes

the structure more fluid and increases skin permeability. The ability of vitamin C serum to repair the horny layer is not enough to beat the electromigration process which is converted into good molecular ions due to strong currents.

The electron drainage is converted into ion flux through the electrode reaction. The process of ion transport through the skin is a process to maintain a neutral electric charge (electron neutrality) (Fukuta et al., 2020). Current application through electrode produce electromigration which causes vitamin C serum molecules to be pushed into or through the skin exert an effect at the cellular and molecular levels of cells where the presence of precursors with low-intensity galvanic currents can generate heat and energy in cell.

It heat and energy is generated through transdermal delivery where the ionizing material in this case the negatively charged vitamin C serum is subjected to a negative electrode current (cathode) with one positive cathode (anode) placed on the body, there will be mutual attraction between the two poles (Bakshi et al., 2020). This causes serum vitamin C to penetrate the cell wall (cell membrane) and increase vascularity. It is this increased vascularity that penetrates serum vitamin C through the lipid bilayer to reduce polymerization and increase the permeability of skin cell walls (Rattanawiatpong, Wanitphakdeedecha, Bumrungrert, & Maiprasert, 2020).

Good vascularization can affect blood circulation in the skin to increase protein production which supports the formation of heat shock protein (HSP). So that it can activate endothelial cells that play a role in producing metalloproteinase I-IV (MTP). Endothelial cells produce MTP II as a nutrient for cell repair and molecules by converting the absorbed nutrients into protein materials (HSP) required by cells and the extracellular matrix to form a network of collagen and fibroblasts in the glycosaminoglycan (GAG) sequence (Jiratchayamaethasakul et al., 2020). Energy balance in cells helps control MTP IV activity so that excessive production of MTP III and IV *transepidermal water loss* (TEWL) which causes the skin to be moist and not dry (Kaushik et al., 2021).

Vitamin C serum has enhanced the repair of the skin's horny layer and lipids, which makes the structure more fluid and increases skin permeability. The effect of interpolar iontophoresis occurs because of the difference in electric charge of the 2 poles, namely the cathode (-) and the anode (+). When a negatively charged ionizing material is subjected to a current through the negative electrode (cathode), then the ionizing material will be quickly penetrated due to an attractive current with the positive electrode (anode) placed on the body while the polar effect of iontophoresis increases the metabolism of the skin glands.

Absorption of ionizing agents through the lipid bilayer reduces polymerization and increases cell wall permeability (Gratieri et al., 2021).

## CONCLUSION

Research on the Differences in Effect of Iontophoresis and Massage with the Addition of Vitamin C Serum on Female Facial Skin Elasticity conducted by 30 female subjects from Tohudan Village conducted 2 times per week for 2 weeks in September – October 2021 Great Results. The results obtained are: Administration of vitamin C serum by iontophoresis method is more effective than administration of vitamin C serum by massage in increasing the elasticity of women's facial skin.

It is recommended that the administration of vitamin C serum with the iontophoresis method be one of the interventions that can be used to increase facial skin elasticity.

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