

# glycolic acid

## C

=Abstract=

### Comparative Study of Glycolic Acid Peeling vs. Vitamin C-iontophoresis in Melasma

San Kim, M.D., Seung Youl Oh, Ph. D.\* , Seung Hun Lee, M.D.

*Department of Dermatology, Yonsei University College of Medicine,  
Sookmyung Women's University, College of Pharmacy \* Seoul, Korea*

**Background :** Glycolic acid has become popular and could provide an alternative choice to the current depigmenting agent. Vitamin C has been known as strong reducing agent and is supposed to retard synthesis of melanin pigment. Iontophoresis is emerging technologies capable of enhancing drug penetration through stratum corneum. Iontophoretic drug delivery may be easier following the chemical enhancer pretreatment

**Objective :** We evaluated the efficacy of vitamin C-iontophoresis and glycolic acid peeling for melasma.

**Methods :** 34 patients with facial melasma were treated with 30% glycolic acid peeling or vitamin C-iontophoresis or 30% glycolic acid peeling combined with vitamin C-iontophoresis. The treatment was performed weekly for a period of 12 weeks. Iontophoresis was performed for 6 minutes under a constant direct current of 0.3-1.0 mA/cm<sup>2</sup>. The exposure time for glycolic acid were 2 minutes. Before and after 12 weeks treatment, the state of melasma was documented using by the modified version of Melasma Area and Severity Index(mMASI) and Mexameter MX 16<sup>®</sup>.

We also measured vitamin C2-phosphate flux by in vitro iontophoresor and HPLC assay.

**Results :** The mean scores of both mMASI and Mexameter MX 16<sup>®</sup> after 12-week treatment were lower than those of baseline in all groups( $p < 0.05$ ).

Increasing vitamin C2-Phosphate concentration and increasing current density correlated with larger flux, and the flux in the first 40 minutes of the experiment appeared to be constantly larger than the steady-state flux during the period of the rest of the experiment, regardless of the current density. Pretreatment by peeling with glycolic acid did not significantly affect the vitamin C2-Phosphate flux through normal skin *in vitro*.

**Conclusion :** Pretreatment by peeling with glycolic acid did not have a major impact on the vitamin C2-Phosphate flux in melasma patient. (**Korean J Dermatol 2001;39(12) : 1356~1363**)

**Key Words :** Melasma, Glycolic acid peeling, Vitamin C-iontophoresis, Vitamin C2-Phosphate flux

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: 135-270

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: (02)3497-3360 Fax : (02)3463-6136

E-mail : ydshderm@yumc.yonsei.ac.kr

glycolic acid C

2,3, C  
가

가 4-12  
C

13,14 1

SPF 15(UVA+UVB)

가 27 55 37

15-17

가 -C Vitamin C2-phosphate, glycolic acid

Glycolic acid 13 Vitamin C2-phosphate HPLC(high performance liquid chromatography)

acid 가 18,19 Glycolic 2. 1) Glycolic acid

glycolic acid 가 C 34

Glycolic acid C 20,21

가 22,23 Glycolic acid 30% unbuffered Fluoro-Gly Pad (TOPIX<sup>®</sup>, New York, USA)

-C glycolic acid

34 -C, glycolic acid 34 glycolic acid

acid 3 mMASI score 10 C

가 24 meter MX 16<sup>®</sup> Mexa- 12 22, 2

glycolic acid 가 24-26, 1 2

-C glycolic acid SPF 15(UVA+UVB) 12

acid -C glycolic phoresor<sup>®</sup>(TAKIMI Co. Ltd., Japan) Ionto-

C2-phosphate (transepidermal flux) 0.3-1.0mA/cm<sup>2</sup> 6 1 12

1. 34 glycolic acid 34 glycolic acid -C

glycolic acid 10, -C glycolic acid gly-

12, 12 3

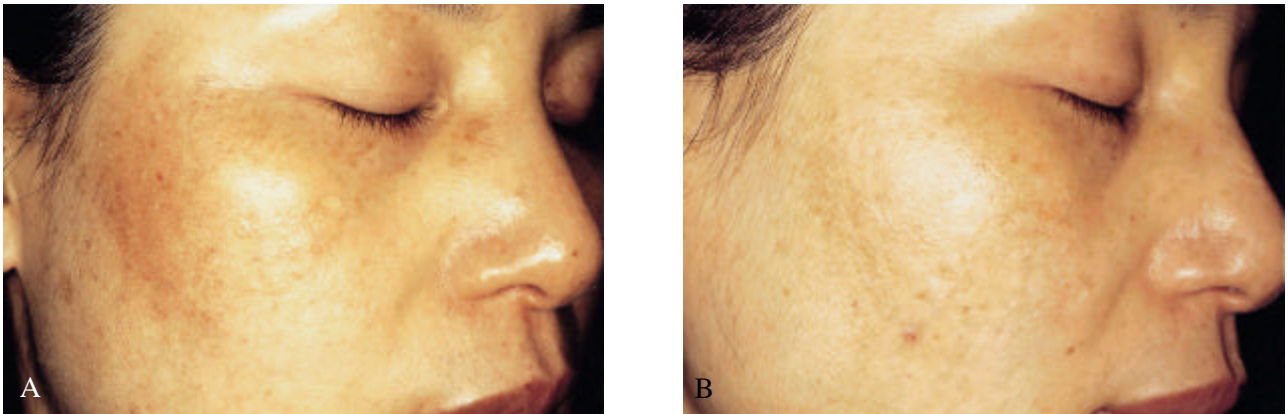


Fig. 1. A. At first visit, 46 years old female with melasma on her malar area.  
 B. After the glycolic acid peeling combined with vitamin-C iontophoresis study(12 weeks), melasma was lightened.

mMASI(modified version of Melasma Area and Severity Index) scoring system (Table 1)<sup>24-25</sup>. system 3

가 (percentage of the total area involved, A), (darkness, D), (homogeneity, H)-

Mexameter MX 16<sup>®</sup>(Courage-Kazak Electronic, Kőln, Germany) 2가 (M, E) M 가<sup>26</sup>.

1000 (Lux) , 800- receptor cell Vitamin C2-Phosphate HPLC

3 . Glycolic acid 30% glycolic acid 2

(worse): (no change); (improved): (much improved) 4

2) HPLC Vitamine C2-Phosphate Flux

0.5% trypsin HBSS<sup>+</sup>(Hank's balanced salt solution) 3

(Donor cell) receptor cell (Fig 2). 0.3, 0.6, 1.0 mA/cm<sup>2</sup>, Vitamin C2 -Phosphate 1.9, 3.8, 9.5% glycolic acid

Vitamin C2-phosphate Flux HPLC 56:44 50% acetonitrile 50mM Ammonium phosphate mobile phase NH<sub>2</sub>(5um) -column oven Vitamin C2-phosphate 254nm

Table 1. Modified version of the Melasma-Area and Severity Index(modified MASI, mMASI), mMASI=(D+H)xA

A; Area	D; Darkness	H; Hormogeneity
0; No involvement	0; absent	0; minimal- scattered pattern
1; less than 10%	1; slight	1; slight- scattered >uniform
2; 10-29	2; mild	2; mild- scattered = uniform
3; 30-49	3; marked	3; marked- scattered<uniform
4; 50-69	4; severe	4; maximum- uniform pattern
5; 70-89		
6; 90-100		

glycolic acid

C

Table 2. mMASI and Mexameter scores(mean ± SD) to each patients before and after (12weeks)

	GA peeling(n=10)		Vit-C iontophoresis(n=12)		GA peel + Vit-C iontophoresis(n=12)	
	mMASI	Mexameter	mMASI	Mexameter	mMASI	Mexameter
Before	8.100 ± 3.071	499.200 ± 7.969	11.583 ± 3.579	503.333 ± 6.527	11.417 ± 5.054	508.417 ± 13.892
After	5.800 ± 2.936	487.700 ± 6.832	7.667 ± 3.393	488.833 ± 11.384	6.750 ± 3.646	491.333 ± 14.131
Mean difference	*2.300 ± 1.418	11.500 ± 8.317	3.917 ± 2.234	14.500 ± 12.162	*4.667 ± 2.570	17.083 ± 11.049
P value	0.0006	0.0018	0.0001	0.0017	0.0001	0.0002

\* There is a significant statistical difference in mMASI score between glycolic acid peeling mean difference and glycolic acid peeling combined with Vit-C iontophoresis mean difference by LSD method(multiple comparison test)

mMASI score      Mexameter      paired-t      16 (47%)  
 test      ,      가      가      가 ,  
 ANOVA test      LSD method      multiple com-      8 (23.5%)  
 parison test      .      p<0.05      ,

mMASI score      Mexameter MX16®

melanin index, M      glycolic acid

1.      Glycolic acid      C      (p<0.05)(Table2).      가  
 29      6.7      1      glycolic acid      -C      가  
 가      (      )      34      29 (85%)      12      가      가      glycolic  
 11 (32%),      10 (17.6%)      acid      -C      ,      가  
 가      8 (80%), 8 (66.6%), 10 (83%)      가  
 가      가      , 0 (0%), 2  
 (16.6%), 1 (8.3%)      , 2

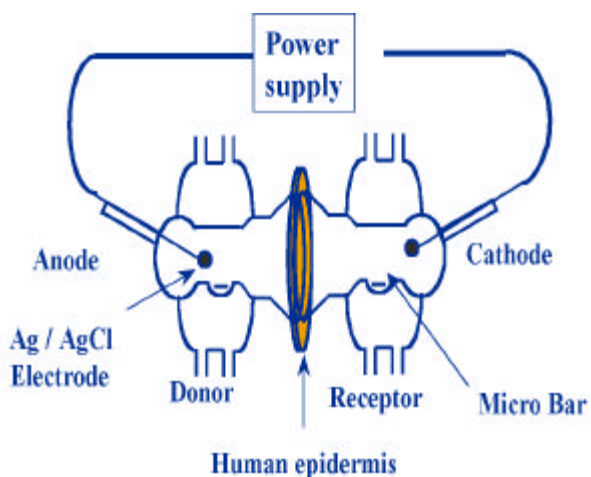


Fig. 2. Schematic figure of the diffusion cell- electrode system for iontophoresis.

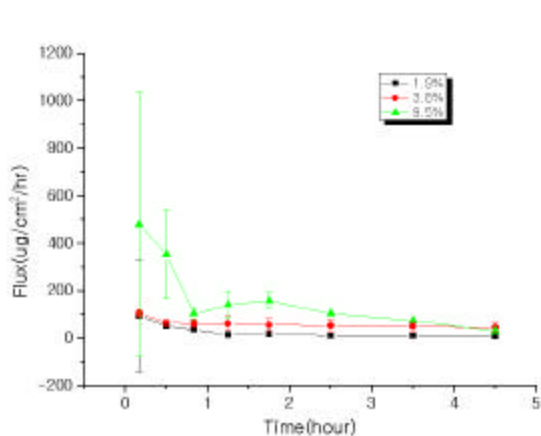


Fig. 3. The effect of vitamin C2-phosphate concentration on iontophoretic flux(current density : 0.6mA/cm²).

(20%), 2 (16.6%), 1 (8.3%) 가 (Fig 5).  
 8  
 (80%), 10 (83%), 10 (83%) 가 가  
 , 가 가  
 가

2. -C  
 HPLC Vitamin C2-Phosphate Flux  
 Vitamin C2-Phosphate 가 가 가 가  
 가 가 ,  
 40 가  
 steady-state (Fig

14,27,28 가 , , ,  
 10% 14.  
 , , , , ,  
 2,3,14 .

3. 4).  
 Glycolic acid Vitamin C2-Phosphate

가  
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 azealic acid가 ,  
 C 2,4,20  
 AHA, Jessner  
 , 1990  
 AHA가  
 glycolic acid 가  
 . glycolic acid 가

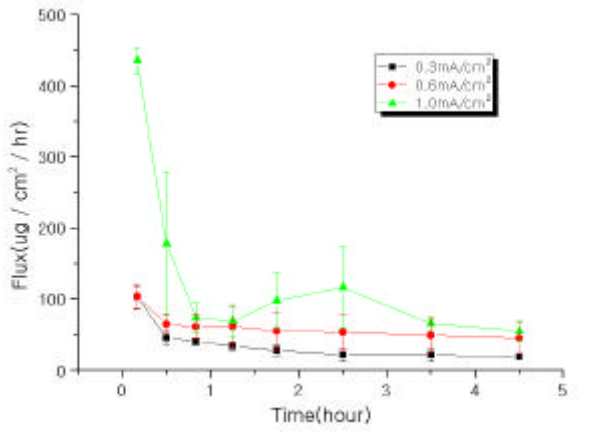


Fig. 4. The effect of current density on iontophoretic flux(vitamine C2-phosphate concentration : 1.9%)

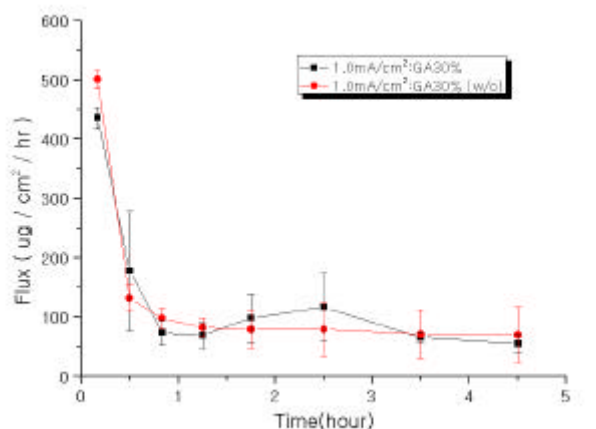
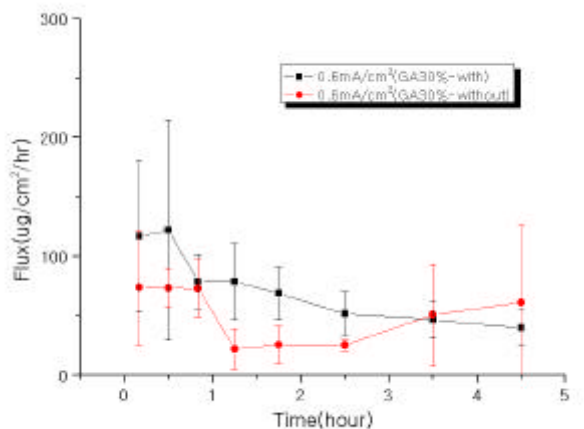


Fig. 5. A, the effect of glycolic acid pretreatment on iontophoretic flux(current density : 0.6mA/cm²) B. The effect of glycolic acid pretreatment on iontophoretic flux(current density : 1.0mA/cm²)

glycolic acid C Mexameter MX16<sup>®</sup>

glycolic acid -C 가 (p>0.05). HPLC Vitamin C2-phosphate (flux) 40 steady-state phosphate 가 가 , Vitamin C2- glycolic acid chemical enhancer 가 가 glycolic acid가 Vitamin C2-phosphate chemical enhancer -helical keratin polypeptide molecule (pore) 가 31,32,33 가 , chemical enhancer 가 34,35 가 34 glycolic acid 3 1 12 mMASI score Mexameter MX16<sup>®</sup> -C HPLC , Vitamin C2-phosphate , glycolic acid Vitamin C2-phosphate mMASI score Mexameter MX16<sup>®</sup> 16 2 1. 37 ( ) 568nm(green), 660nm(red), 880nm(infrared) 6.7 . ( ) melanin index erythema 2. mMASI score Mexameter MX16<sup>®</sup> glycolic acid , mMASI score (p<0.05)(Table 2).

3. glycolic acid  
-C  
가  
( $p > 0.05$ )(Table 2).
4. HPLC Vitamin C2-phosphate  
Vitamin C2-Phosphate 가 가  
가 가 가 ,  
40  
가 steady-state  
(Fig. 3.4).
5. Glycolic acid Vitamin C2-Phosphate  
(Fig 5).
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