

# 에피라식에서 성공적 각막상피 분리에 영향을 미치는 요소

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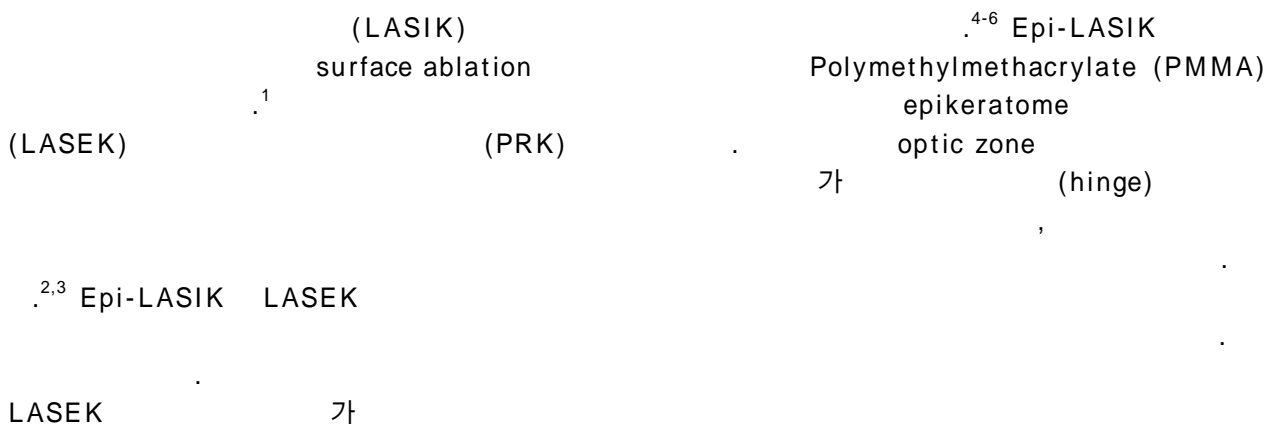
**목적** : Epi-LASIK에서 각막상피분리와 관련된 합병증의 발생률과 이에 영향을 미치는 수술 전 또는 수술 중 요소에 대하여 알아보고 수술방법에 따른 임상적 유용성을 알아보고자 하였다.

**대상과 방법** : Centurion SES™ epikeratome (Norwood Eye Care, Australia)를 이용하여 상피분리를 시행한 122안을 대상으로 수술 전 각막곡률, white-to-white distance, 중심각막두께, 굴절이상, 건성안, 점상각막상피미란, 판누스, 콘택트렌즈 착용 여부, 종류 및 사용시간 등이 각막상피분리와 관련된 합병증 발생에 미치는 영향을 조사하였다. 또한 상피분리 도중 개검기의 안검 압박을 통한 안압 상승이 상피분리 합병증을 줄일 수 있는지에 대해 조사하였다.

**결과** : 성공적 상피분리는 74안(60.6%), 불완전 상피절편은 29안(23.8%), 유리상피절편은 19안(15.6%)이었다. 중심 각막 두께(P=.041), 콘택트렌즈 착용여부(P=.008) 및 착용기간(P=.003)이 상피분리 합병증 발생에 유의한 연관성을 보였으며, 수술 중 개검기를 이용한 안검압박으로 성공적 상피분리의 비율이 50.6%에서 83.8%로 증가하였다(P=.003).

**결론** : 각막 두께가 얇고, 콘택트렌즈를 착용하는 환자에서 상피분리와 연관된 합병증이 많이 발생하며 개검기를 이용해 안검을 압박하는 방법이 수술 중 상피분리의 성공률을 높이는 데에 유용할 것으로 생각된다.

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대상과 방법	
2005 7	2006 10
Epi-LASIK	66 122
(ORB scan II, Bausch and Lomb) 5 mm	white-to-white

\* 본 논문의 요지는 2006년 대한안과학회 제96회 추계학술대회에서 구연으로 발표되었음.

Technology, Inc., USA) DGH 1000 (DGH

Fluorescein Sodium Ophthalmic Strip (Haag-Strait Co.)

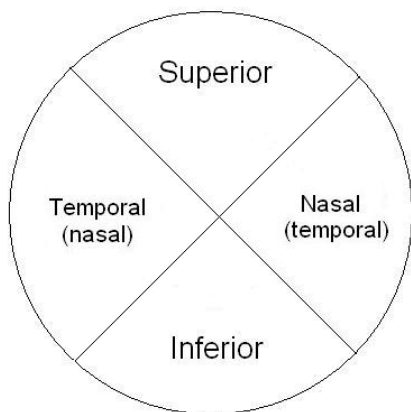
cobalt blue illumination  
3 mm wide scanning beam

5 ( ), 5  
9 ( ), 10 ( )

4 mm  
90 4 ( ) 4 ( )  
90 4 4 ( )  
) 4 (4 ) (Fig. 1).

0.5% propacain hydrochloride

(A)



(Alcaine<sup>®</sup>, Alcon, USA)  
Barraquer

Balanced salt solution (BSS, Alcon, USA)

EpiEdge separator  
Epi-microkeratome (Centurion SES, Norwood Eyecare, Australia)

640 mmHg  
separator, BSS separator

separator 12,000 rpm, 2 mm/min  
separator, BSS

separator가  
Epi-microkeratome

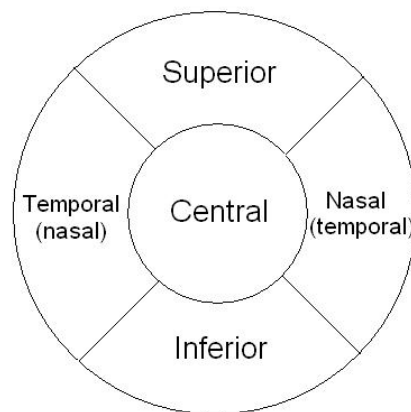
가  
hockey stick blade (BD ophthalmic systems, USA)

122 37 nasal type  
Lieberman speculum  
Epi-microkeratome

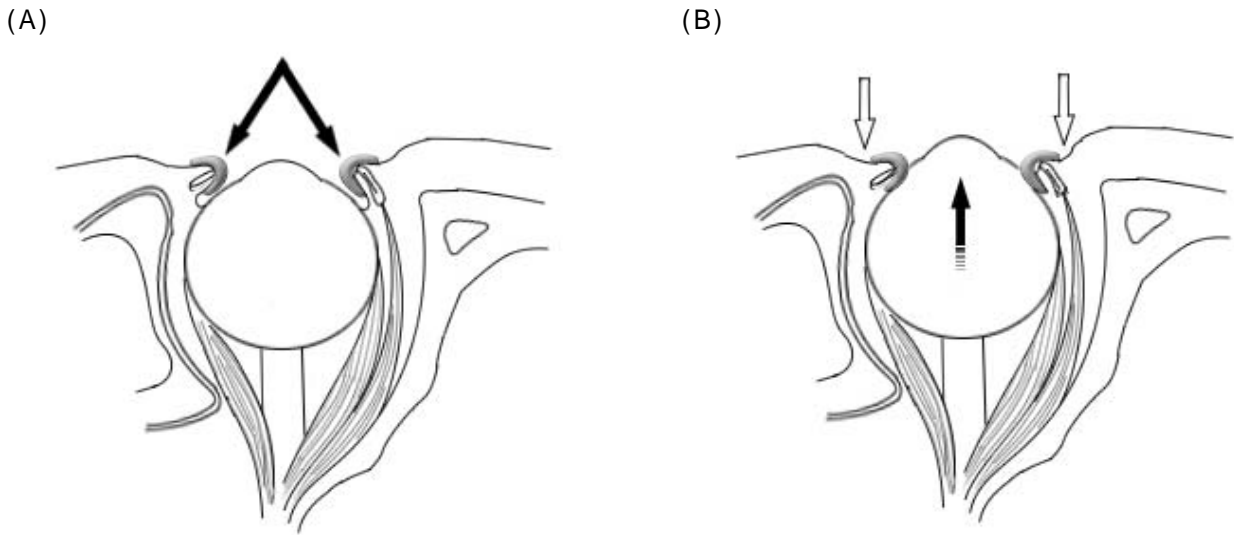
(Fig. 2).

SPSS 10.1 Chi-square test One-way ANOVA

(B)



**Figure 1.** (A) Diagram of corneal surface to describe punctate erosion. The whole cornea was divided into 5 parts: superior, inferior, nasal, temporal, and central (4 mm in diameter in the center). (B) Diagram of the corneal surface to describe pannus. The whole cornea was divided into 4 parts: superior, inferior, nasal, and temporal.



**Figure 2.** (A) Normal orbital structure with speculum (arrow). (B) Changes after pressing down the eyelids. Increased intraorbital pressure makes the eyeball to protrude and corneal curvature steeper.

**결 과**

122 74 (60.6%) 29 (23.8%), 19 (15.6%) 가 (P = .914)(Table 2).

536±26 μm, 534±31 μm 547±27 μm, 가 (P = .857)(Table 3). 가 118 , 1 (P = 0.041). -4.32±1.8D, -4.31±1.5D, -4.17±1.3D (P = 0.934). White-to-white 11.5±0.3 mm, 11.5±0.4 mm, 11.7±0.3 mm, 5 mm 42.8±1.4D, 43.2±1.5D, 42.2±1.9D (P = .866)(Table 4). 가 68 , 가 54 가 41 (75.9%), 33 (48.5%) (P = .008). (Table 1). 51 , 17

**Table 1.** Preoperative patients parameter and flap-related complications

Parameters	Mean (±SD)			P
	Complete flap	Incomplete flap	Free flap	
No. of cases (%)	74 (60.6%)	29 (23.8%)	19 (15.6%)	
Amount of ablation	-4.32±1.8D	-4.31±1.5D	-4.17±1.3D	.934
Corneal thickness	547±27 μm <sup>†, ‡</sup>	536±26 μm <sup>†</sup>	534±31 μm <sup>‡</sup>	.041*
White-to-white distance	11.5±0.3 mm	11.5±0.4 mm	11.7±0.3 mm	.095
Corneal curvature (5 mm)	42.8±1.4	43.2±1.5	42.2±1.9D	.079

\* Statistically significant.

One-way ANOVA

<sup>†, ‡</sup>: The same symbols indicate significant difference between groups based on Tukey's multiple comparison test.

**Table 2.** Dry eye and flap-related complications

Tearfilm break-up time (second)	Incidence (%)			Total
	Complete flap	Incomplete flap	Free flap	
< 5	5 (62.5)	1 (12.5)	2 (25)	8
5- 9	8 (61.5)	3 (23.1)	2 (15.4)	13
10 ≤	61 (60.4)	25 (24.8)	15 (14.8)	101

Chi-square, P=.914

**Table 3.** Punctate erosion and flap-related complications

Punctate erosion*	Incidence (%)			Total
	Complete flap	Incomplete flap	Free flap	
0	57 (58.2)	23 (23.5)	18 (18.3)	98
1	7 (58.4)	4 (33.3)	1 (8.3)	12
2	5 (71.4)	2 (28.6)	0 (0)	7
2 <	3 (60)	1 (20)	1 (20)	5

Chi-square, P=.857

\* Sum of each scale of five corneal regions (superior, inferior, nasal, temporal, and central) graded using a 0-4 scale.

**Table 4.** Pannus and flap-related complications

Pannus*	Incidence (%)			Total
	Complete flap	Incomplete flap	Free flap	
0	71 (60.2)	28 (23.7)	19 (16.1)	118
1	2 (66.7)	1 (33.3)	0 (0)	3
1 <	1 (100)	0 (0)	0 (0)	1

Chi-square, P=.866

\* Numbers of quadrant of corneal involvement.

**Table 5.** Contact lens wear and flap-related complications

	Incidence (%)			Total	P
	Complete flap	Incomplete flap	Free flap		
Contact lens use					
Non user	41 (75.9)	7 (13)	6 (11.1)	54	.008*
user	33 (48.5)	22 (32.4)	13 (19.1)	68	
Type of contact lens					
Soft contact lens	24 (47.1)	18 (35.3)	9 (17.6)	51	.648
Hard contact lens	9 (53)	4 (23.5)	4 (23.5)	17	

Chi-square

\* Statistically significant.

**Table 6.** Pattern of contact lens wear and flap-related complications

Pattern	Mean±SD			P
	Complete flap	Incomplete flap	Free flap	
Frequency of CL wear (day/week)	4.06±2.03	6.10±1.09	5.38±1.69	.133
Period of CL wear (year)	6.72±4.21	9.53±4.07†	5.43±4.04†	.003*

\* Statistically significant.

One-way ANOVA

† The same symbols indicate significant difference between groups based on Tukey's multiple comparison test.

24 (47.1%), 9 (53%)

(P=.648)(Table 5).

6.72±4.21, 9.53±4.07, 5.43±4.04

(P=.003), 1

4.06±2.03, 6.10±1.09, 5.38±1.69

(P=.133)

(Table 6).

가 37 31 (83.8%)

85 43 (50.6%)

29.4% 10.8%

(P=.003)(Table 7).

### 고찰

Chen et al<sup>3</sup> LASEK

Pallikaris et al<sup>5</sup>  
Epi-LASIK LASEK

가



5 mm

(P = .079).

white-to-white distance

( P = .934, .095).

### 참고문헌

Lieberman speculum      가  
nasal type  
epikeratome

가

29.4%      10.8%  
50.6%      83.8%  
(P = 0.003).

가

(P = .008).

(P = .648).

가

가

(integrity)

가

hemidesmosome

가

12-14

가

12,15-19

(P = .133, .003)

가

가

Epi-LASIK

(P = .914, .857, 866).

Epikeratome

가

- 1) Duffey RJ, Leaming D. US trends in refractive surgery:2003 ISRS/AAO survey. J Refract Surg 2005;21:87-91.
- 2) Lee JB, Seong GJ, Lee JH, et al. Comparison of laser epithelial keratomileusis and photorefractive keratectomy for low to moderate myopia. J Cataract Refract Surg 2001;27: 565-70.
- 3) Chen CC, Chang JH, Lee JB, et al. Human corneal epithelial cell viability and morphology after dilute alcohol exposure. Invest Iphthalmol Vis Sci 2002;43:2593-602.
- 4) Pallikaris IG, Katsanevaki VJ, Kalyvianaki MI, Naoumidi II. Advances in subepithelial excimer refractive surgery techniques:Epi-LASIK. Curr Opin Ophthalmol 2003;14:207-12.
- 5) Pallikaris IG, Kalyvianaki MI, Katsanevaki VJ, Ginis HS. Epi-LASIK:preliminary clinical results of an alternative surface ablation procedure. J Cataract Refract Surg 2005;31:879-85.
- 6) Azar DT, Ang RT, Lee JB, et al. Laser subepithelial keratomileusis: electron microscopy and visual outcomes of flap photorefractive keratectomy. Curr Opin Ophthalmol 2001;12:323-8.
- 7) Nichols KK, Nichols JJ, Mitchell L. The relation between tear film tests in patients with dry eye disease. Ophthalmic Physiol Opt 2003;23:553-60.
- 8) Kim JH, Oh CH, Song JS, Kim HM. Inadvertent stromal dissection during mechanical separation of the corneal epithelium using an epikeratome. J Cataract Refract Surg 2006;32:1759-63.
- 9) Matsumoto JC, Chu YS. Epi-LASIK update:overview of techniques and patient management. Int Ophthalmol Clin 2006;46:105-15.
- 10) Shah S, Sebai Sarhan AR, Doyle SJ, et al. The epithelial flap for photorefractive keratectomy. Br J Ophthalmol 2001;85:393-6.
- 11) Vesaluoma M, Perez-Santonja J, Petroll WM, et al. Corneal stromal changes induced by myopic LASIK. Invest Ophthalmol Vis Sci 2000;41:369-76.
- 12) Holden BA, Sweeney DF, Vannas A, et al. Effects of long-term extended contact lens wear on the human cornea. Invest Ophthalmol Vis Sci 1985;26:1489-501.
- 13) Vannas A, Holden BA, Makitie J. The ultrastructure of contact lens induced changes. Acta Ophthalmol 1984;62:320-33.
- 14) Bourne WM, Hodge DO, McLaren JW. Estimation of corneal endothelial pump function in long-term contact lens wearers. Invest Ophthalmol Vis Sci 1999;40:603-11.
- 15) Bruce AS, Brennan NA. Corneal pathophysiology with contact lens wear. Surv Ophthalmol 1990;35:25-58.
- 16) Liesegang TJ. Physiologic changes of the cornea with contact lens wear. CLAO J 2002;28:12-27.
- 17) Liu Z, Pflugfelder SC. The effects of long-term contact lens

- wear on corneal thickness, curvature, and surface regularity. Ophthalmology 2000;107:105-11.
- 18) Braun DA, Anderson Penno EE. Effect of contact lens wear on central corneal thickness measurements. J Cataract Refract Surg 2003;29:1319-22.
- 19) Madigan MC, Holden BA. Reduced epithelial adhesion after extended contact lens wear correlates with reduced hemidesmosome density in cat cornea. Invest Ophthalmol Vis Sci 1992;33:314-23.

**=ABSTRACT=**

## Factors Associated with the Successful Separation of Corneal Epithelium in Epi-LASIK

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**Purpose:** To determine the incidence and perioperative factors of flap-related complications from Epi-LASIK.

**Methods:** In this study, 122 eyes of 66 patients who had Epi-LASIK using Centurion SES<sup>TM</sup> epikeratome (Norwood Eye Care, Australia) were enrolled. Associations of pre-operative corneal curvature, white-to-white distance, central corneal thickness, refractive error, dry eye, punctate corneal erosion, pannus, and history of wearing contact lenses with flap-related complications were investigated. To decrease flap-related complications, surgeons pressed patients' eyelids with a speculum during epithelial separation, and the effect of this method was verified.

**Results:** Complete epithelial separation was achieved in 74 eyes (60.6%), incomplete separation in 29 eyes (23.8%), and free epithelial sheet in 19 eyes (15.6%). Thin corneas ( $P=.041$ ), a history of wearing contact lenses ( $P=.008$ ), and the duration of contact lens use ( $P=.003$ ) significantly decreased the incidence of successful epithelial separation. Pressing down the eyelids with a speculum while separating the epithelial sheet increased the incidence of complete separation from 50.6% to 83.8% ( $P=.003$ ).

**Conclusions:** The risk of flap-related complications from Epi-LASIK may be higher in people who use contact lenses and in people who have thin corneas. The risk can be reduced by pressing the eyelids with a speculum during epithelial separation.

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**Key Words:** Epi-LASIK, Epithelial separation, Flap, Incomplete separation, Speculum

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