

## Original Article

# Corneal Haze after Wavefront Guided PRK at Dr Yap Eye Hospital Yogyakarta: Is There Any Difference Between Low And High Myopia?

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## ABSTRACT

**Background:** Wavefront guided Photorefractive Keratectomy (PRK) has regained its popularity. However corneal haze after this procedure often follows. Five to 15% of PRK patients developed corneal haze. The purpose to investigate whether the presence of corneal haze after PRK in low, moderate, and high myopia patients are different and whether these differences influence visual outcome

**Method:** This was a restrospective cohort study of 589 eyes underwent PRK at Yap Eye Hospital between 2011 and 2012. Visual acuity, refractive status, and corneal haze were examined at 6 times follow up after PRK. Corneal haze was defined as persistent hazy found at three times follow up including the fifth and sixth follow up.

**Result:** There were 207 males and 77 females with mean age 23,2 years who has clear cornea and 21.5 whose hazy cornea. We found 11.5% of corneal haze in low myopia and 11.2% in high myopia. The proportion of corneal haze in different severity of myopia was not statistically significant ( $p=0.38$ ). Regardless of the presence of corneal haze, the final visual outcome after PRK wavefront guided was overall good to excellent (1.00). However the corneal haze condition was resolved in six months after.

**Conclusion:** The presence of corneal haze after wavefront guided PRK was similar across different severity of myopia. The presence of corneal haze did not influence the final visual outcome, which was overall good to excellent.

**Keywords:** wavefront guided PRK, myopia, corneal haze, visual outcome

Wave-front-guided refractive surgery differs from conventional LASIK and PRK in that rather than applying a spherocylindrical correction to the cornea, the laser ablates a sophisticated pattern based on measurements from an aberrometer.<sup>1</sup>

Better and more refined ablation algorithms mean more accurate and predictable post-op outcomes, and aberrometer improvements have enhanced the precision with which refractive errors are captured. Surface ablation is growing in popularity, partly because of an increased understanding of risk factors for ectasia after LASIK.<sup>1,2</sup>

Both nearsighted and farsighted people can benefit from PRK. With nearsighted people, the goal is to flatten the too-steep cornea; with farsighted people, a steeper cornea is desired. Also, excimer lasers can correct astigmatism, by smoothing an irregular cornea into a more normal shape.<sup>2</sup> Many surgeons prefer PRK in circumstances such as when patients have thin corneas.<sup>3</sup>

Corneal haze describes when the cornea becomes cloudy or opaque. The cornea is normally clear, so corneal haze can greatly impair vision. Although the haze can occur in any part of the cornea, it is most often found within the thicker, middle layer of the cornea, called the stroma.<sup>4</sup>

Corneal haze is most often caused by inflammatory cells and other debris that is activated during trauma, infection or surgery. Corneal haze sometimes occurs during laser vision correction procedures. Although it can occur in Lasik, it is more often associated with procedures such as PRK or LASIK.<sup>5</sup>

Corneal haze after photorefractive keratectomy (PRK) usually appears within 4 weeks after the procedure. A new type of corneal haze, starting relatively late after PRK, is reported. Five to 15% of PRK patients developed corneal haze.<sup>1</sup>

The corneal haze incidence has declined since doctors have begun using the medicine mitomycin C directly following the laser procedure.<sup>6</sup>

The risk of corneal haze increases with the depth of the ablation (how much tissue the laser removes). The more nearsighted a patient is, the more tissue that will need to be removed.<sup>7</sup>

Consequently, patients with medium to

high myopia (greater than six diopters) will have a higher risk of a haze than those who are less nearsighted.<sup>8</sup>

Some corneal haze is normal and expected, however, as the eye heals. This healing process must be modulated in the post PRK eye with the use of topical steroids that are generally used for about three months post operatively.<sup>9,10</sup>

Since photorefractive keratectomy was approved by the FDA in 1995, patient outcomes have steadily improved. Better visual results, fewer complications and reduced pain after the surgery have all contributed to increased interest in surface ablation.<sup>9,10,11</sup>

It required time for epithelial healing in PRK. It can take a week to recover an intact epithelium and several weeks before best-corrected acuity is achieved. But now there may be ways to speed epithelial healing after PRK, as well as further improve pain control, according to surface ablation specialists.<sup>12</sup>

PRK attractive candidates especially useful in patients with thin corneas, large pupils, corneal scars, epithelial basement membrane disease or a history of radial keratotomy, channel IOLs or corneal transplants.<sup>1,11,1</sup>

The purpose of this retrospective cohort study is to investigate whether the presence of corneal haze after PRK in low, moderate, and high myopia patients are different and whether these differences influence visual outcome

## METHODS

This was a retrospective cohort study of the data from 589 eyes underwent PRK at Yap Eye Hospital between 2011 and 2012.

Myopia classified by 3 degrees or se]cluding the fifth and sixth follow up.

## RESULTS

This retrospective cohort study was found that there were 515 eyes (87.4%) without haze and 74 eyes (12.6%) from all of 589 eyes whose underwent PRK at Yap Eye Hospital between 2011 and 2012.

**Table 1.** Comparison of Characteristics of Patients

	No haze	Haze	p-value
	Mean (SD)/ median (IQR)		
Average Age ( years)	23.2 (7.33)	21.5 (6.05)	0.044
Gender (person)			
Male	179 (86.5%)	28 (13.5%)	0.30
Female	77 (89.6%)	9 (10.4%)	

There were 207 males and 77 females with mean age 23,2 years who has clear cornea. There were 28 males and 9 females with the mean age 21.5 whose hazy cornea.

**Table 2.** Comparison of Different Degrees of Myopia

	No haze	Haze	p-value
Low (-1.0 – -3.0)	223 (88.5)	29 (11.5)	0.38
Moderate (-3.0 – -6.0)	141 (84.4)	26 (15.6)	
High ( $\leq$ -6.0)	151 (88.8)	19 (11.2)	

It is found 11.5% of corneal haze in low myopia and 11.2% in high myopia. The proportion of corneal haze in different severity of myopia was not statistically significant ( $p=0.38$ ).

**Table 3.** Comparison of Pachymetry Datas

	No haze	Haze	p-value
	Mean (SD)/ median (IQR)		
Pachymetry, $\mu$	578 (37.4)	583 (35.7)	0.18
Ablation, $\mu$	94 (53 – 127)	86.5 (62 – 129.5)	0.74
Stromal bed, $\mu$	424 (387 – 475)	439 (391 – 463)	0.56
Pulsation	3053 (1604 – 4367)	2755 (1952 – 4412)	0.71

The stromal base of those eyes having corneal haze was 439 $\mu$ m and whose got no corneal haze was 424 $\mu$ m, not significantly different ( $p=0.56$ ).

**Table 4.** Final Visual Acuity

	No haze	Haze	p-value
	Mean (SD)/ median (IQR)		
Initial visual acuity	0.08 (0.02 – 0.20)	0.08 (0.03 – 0.20)	0.75
Final visual acuity	1.00 (0.75 – 1.20)	1.00 (1.00 – 1.20)	0.81
Initial spherical equivalent	-3.50 (-6.50 – -1.75)	-3.50 (-6.00 – -1.50)	0.70

Regardless of the presence of corneal haze, the final visual outcome after PRK wavefront guided was overall good to excellent (1.00).

## DISCUSSION

The haze appears in the subepithelial layer of the cornea and presents as a reticular pattern of opacity. The major sign is the characteristic slit lamp exam appearance. The density of the haze is graded from one, which represents trace haze, to four, which represents marked haze.<sup>10</sup> In this study, we didn't evaluate the grade of haze, we define haze as persist or no haze.

There were 207 males and 77 females with mean age 23,2 years who has clear cornea. There were 28 males and 9 females with the mean age 21.5 whose hazy cornea. This retrospective cohort study was found that there were 515 eyes (87.4%) without haze and 74 eyes (12.6%) from all of 589 eyes.

The degree of haze correlates with the severity of symptoms. Some patients with mild haze do not note visual distortion, while those with greater haze may complain of decreased vision.

Early post-ablation haze tends to first emerge a few weeks after a PRK procedure. Its natural history is to intensify until it reaches its peak at approximately one to two months after PRK. The haze then begins to slowly resolve as the patient reaches their sixth to twelfth post-operative month. Symptoms depend on the degree of haze, but his early transitory haze may even be asymptomatic. A second form of haze develops later (often two to five months after surgery) and is more likely to cause a significant decrease in a patient's vision.<sup>11</sup>

Patients are not normally aware of this haze until it begins to impact their visual acuity. Haze can cause glare at night from bright lights which may or may not interfere significantly with vision undr low lights conditions. Corneal haze usually reduces and cure spontaneously within 6 to 9 months. However it maynot disappear in all cases.<sup>12</sup>

However the corneal haze condition was resolved in six months after surgery in this study.

In general, the greater the degree of treatment required, the greater the risk of significant corneal haze developing as the eye heals. In this study,the result showed that the ablation and the stromal base between the patient with corneal haze and non corneal haze were not

statistically different ( $p$ -value 0.74). The data showed ablation in eyes which resulted no haze was  $94\ \mu\text{m}$  (53 – 127) and  $86.5\ \mu\text{m}$  (62 – 129.5)

There was complete recovery of best spectacle corrected visual acuity<sup>1</sup>The visual acuity both in the corneal haze and non corneal haze were good to excellent (1.00).

## CONCLUSION

The presence of corneal haze after PRK wavefront guided was similar across different severity of myopia. The corneal haze found in 74 patients. It is 11.5% in low myopia and 11.2% in high myopia. The proportion of corneal haze in different severity of myopia was not statistically significant ( $p=0.38$ ).

The presence of corneal haze did not influence the final visual outcome, which was overall good to excellent (1.00).

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