Predictors of Postoperative Dry Eye Disease in Refractive Surgery Patients

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Background

Dry eye disease (DED) is a common concern after corneal refractive surgery, but whether it is driven by surgical factors or preexisting ocular surface dysfunction remains unclear

Aim

To evaluate preoperative DED prevalence, identify longitudinal ocular surface changes and predictors of postoperative DED, following photorefractive keratectomy (PRK).

Methods

- Retrospective cohort study of consecutive PRK patients with or without preoperative DED.
- Ocular surface evaluation was performed at the initial examination, on preoperative day-1, and at postoperative months 1, 3, and 6.
- Assessed parameters at all visits included DEWS III-defined DED, ocular surface disease index (OSDI), non-invasive tear breakup time (NIBUT), tear breakup time (TBUT), Schirmer test, meibomian gland dropout and fluorescein staining
- Preoperative ocular surface comorbidities, artificial tear use, contact lens wear, and key surgical parameters (ablation depth, residual stromal thickness, central corneal thickness, mitomycin-C exposure time, and bandage contact lens duration) were recorded.
- Eyes with DED at initial examination were treated before surgery.
- Intergroup comparisons were performed according to preoperative DED status at each time point. Univariable analyses were conducted to identify for predictors of postoperative DED.
- Longitudinal outcomes were assessed using linear mixed-effects models including time, preoperative DED status, and time-by-group interaction; Bonferroni correction was applied for pairwise comparisons.

Results

- 179 eyes of 91 PRK patients were included.
- Figure 1 shows the prevalence of DED in the whole cohort.
- Of 179 eyes, 74 (41.3%) were with DED and 105 (58.7%) without DED.
- At initial visit, eyes with DED had significantly higher median OSDI and lower median TBUT compared to controls (31.25 vs 7.50, $p < 0.001$; 8.00 vs 12.00, $p < 0.001$, respectively). In this group, the median TBUT improved before surgery; however, OSDI remained significantly higher compared to controls until postoperative month 6.
- Postoperative DED predictors were female sex (p=0.009) and DED at initial examination (p=0.029). No surgical parameter was associated with postoperative DED.
- OSDI changed significantly over time and differed between groups ($p = 0.027$ and $p < 0.001$, respectively), with a significant time-by-group interaction ($p = 0.001$), whereas NIBUT, TBUT, and meibomian gland dropout remained stable (all $p > 0.05$); Schirmer values decreased significantly over time ($p < 0.001$), particularly at 6 months. Figure 2 and figure 3 illustrate the significant longitudinal change in OSDI and the relative stability of NIBUT over time.

Figure 1. Prevalence of preoperative DED in the study cohort.

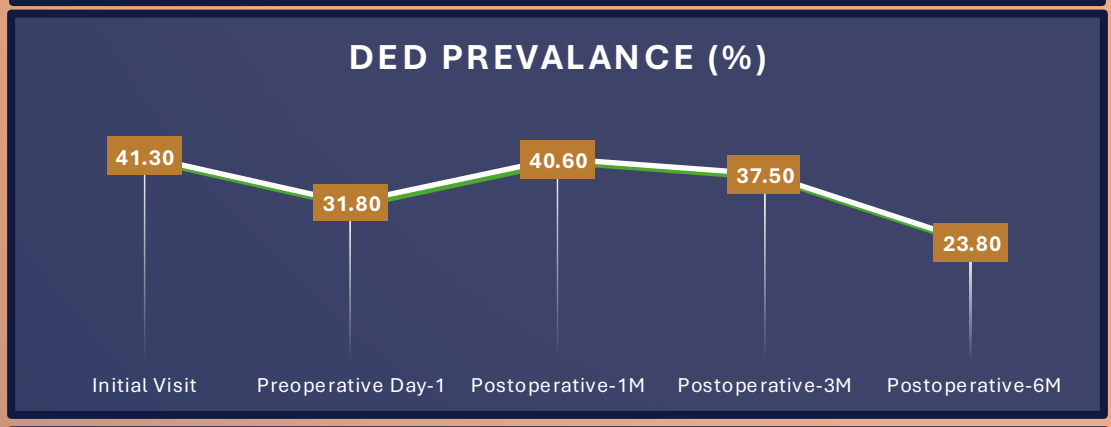


Figure 2. Longitudinal change in OSDI in eyes with and without preoperative DED.

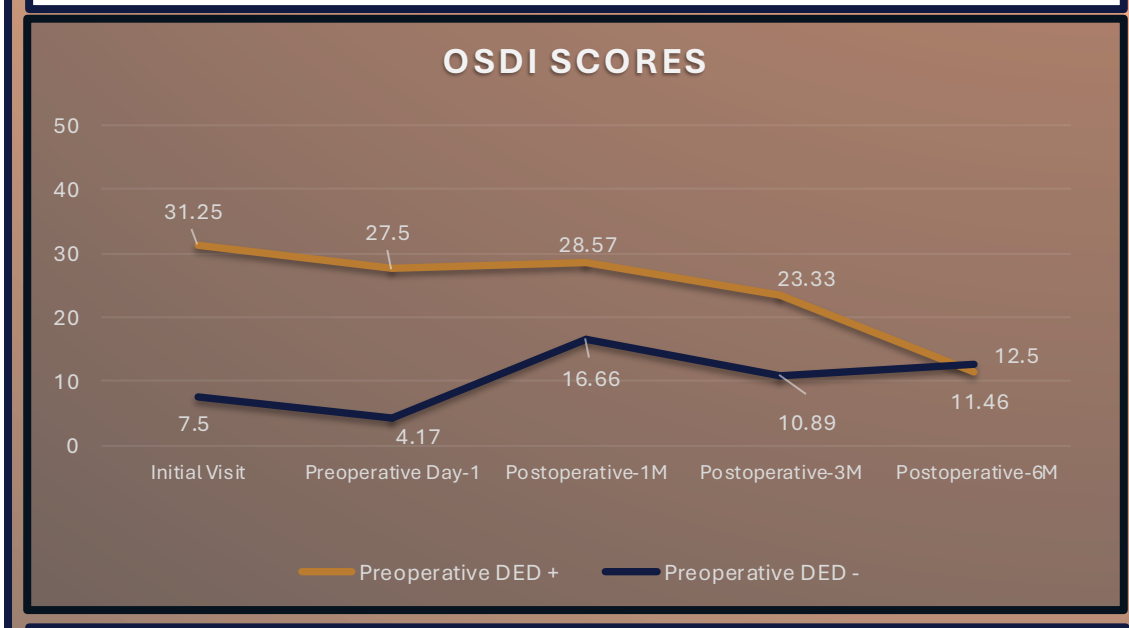
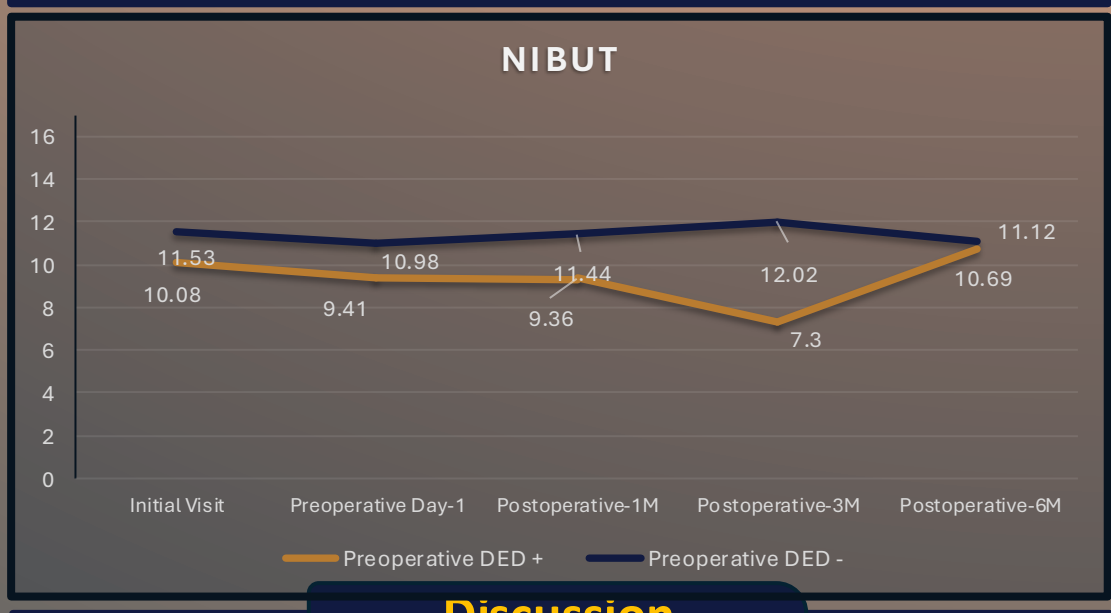


Figure 3. Longitudinal change in NIBUT in eyes with and without preoperative DED.



Discussion

Previous studies have identified pre-existing DED as a major risk factor for postoperative DED after refractive surgery, while the contribution of surgical factors has been less consistent across reports (1,2). Consistent with these results, in our cohort, preoperative DED was the main predictor of postoperative DED.

Conclusion

In refractive surgery candidates preoperative tear film and ocular surface evaluation and optimization are essential prior to surgery to optimize surgical outcomes.

In patients undergoing PRK, postoperative DED was primarily associated with preexisting ocular surface dysfunction, rather than surgical factors.

References

1. Nair, A. A., et al. *Refractive surgery and dry eye: An update*. 2023.
2. Dossari SK, et al. Post-refractive surgery dry eye: a systematic review. Cureus. 2024