Expert Opinion: How Does Tear Osmolarity Apply to Surgical Candidates?

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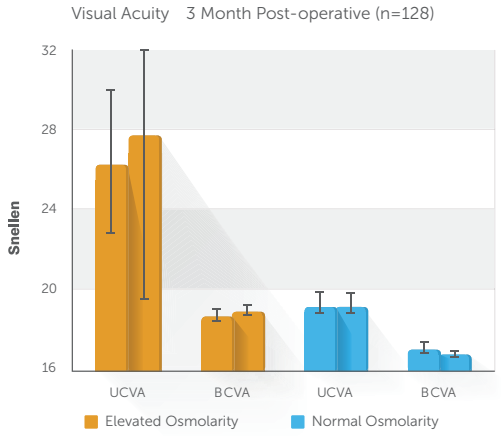
Does hyperosmolarity undermine your surgical outcomes? This question is the headline of interesting evidence provided by TearLab. According to their randomized, masked, controlled trials, it was reported that among hyperosmolar patients, the difference between best corrected visual acuity (BCVA) and uncorrected visual acuity (UCVA) in patients undergoing lasik was significant.[1]

Pre-surgical hyperosmolarity predicts poor uncorrected vision after LASIK[1]



Among hyperosmolar patients after lasik, the difference between best corrected visual acuity (BCVA) and uncorrected visual acuity (UCVA) was significant[1]

Suggests unanticipated post-operative refractive outcome

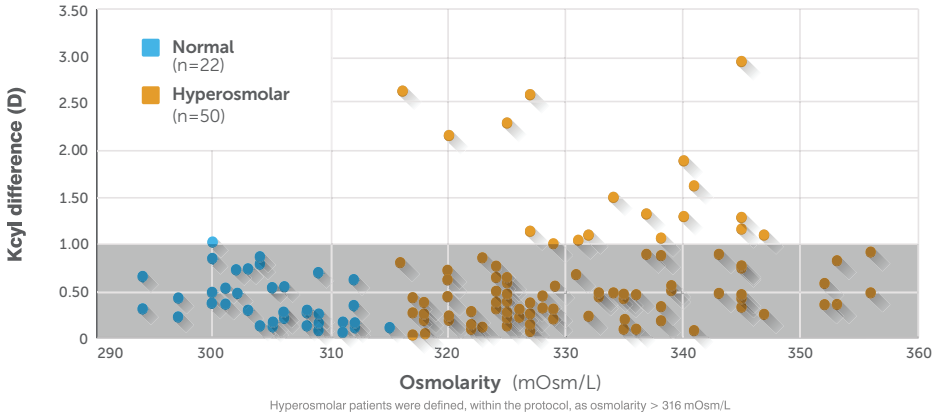
Not only did the research support poor uncorrected vision after LASIK in the hyperosmolar patients, but 86% of physicians also reported that mild to moderate dry eye significantly impacts patient satisfaction in post-operative cataract and refractive patients.[2] This is interesting data as the prevalence of dry eye symptoms prior to undergoing LASIK is estimated to be between 38% and 75%.[3] Dry eye disease has a complex and multifactorial etiology. Any factor that disrupts the ocular surface environment will lead to tear dysfunction and an increase in osmolar concentration of the tear film. Although there is no single diagnostic test for dry eyes, there is increasing evidence that tear osmolarity testing can provide crucial information about dry eye severity and may be of value in identifying patients at risk for post-LASIK dry eye.

Many physicians routinely start cataract surgery patients on omega-3 nutritional supplementation which have been shown in research to improve tear osmolarity, tear breakup time (TBUT), (OSDI) symptom scores and omega index levels.[4] There is also evidence that omega-3s may speed epithelial healing and visual recovery after PRK and may help with nerve regeneration.[5,6,7] Recommendations for Omega-3 supplementation in treatment of dry eye disease and meibomian gland dysfunction prior to cataract surgery have also been shown to increase both its success and patients' satisfaction.[8]

Hyperosmolarity affects pre-surgical cataract biometry measurements[9]

In a recent observational, prospective study 75 subjects were evaluated at two preoperative visits and placed in two tear osmolarity study groups; normal and hyperosmolar.

There was a statistically significantly higher variability in avg K readings in the hyperosmolar group and 10% of these hyperosmolar subjects had a difference in IOL power calculations of 1/2 D or more. Vector analysis of Kcyl showed 17% of hyperosmolar eyes had >1D cyl difference bx 2 pre surgical visits.[9]



Hyperosmolar patients were defined, within the protocol, as osmolarity > 316 mOsm/L

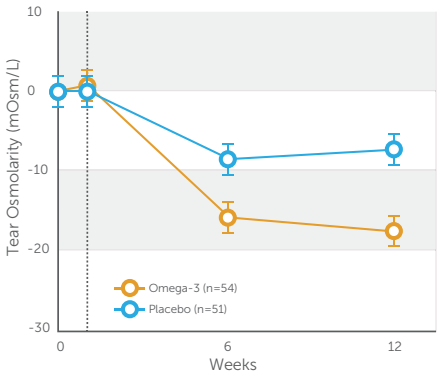
17% of hyperosmolar eyes had > 1 D (diopter) of difference in keratometry cylinder values between two pre-surgical visits

10% of hyperosmolar eyes had >0.5 D (diopter) of change in calculated IOL power

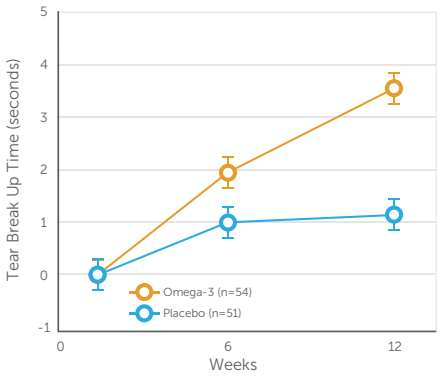
Results shown are in 12 weeks against placebo[4]

This investigational Tear Osmolarity study demonstrated that oral consumption of re-esterified triglyceride omega-3 essential fatty acids (1680mg EPA and 560mg DHA) as a consistent daily nutritional regimen showed a statistical improvement against placebo in normalizing tear osmolarity after only 12 weeks. This study also demonstrated a statistically significant improvement in OSDI symptom scores, TBUT and omega 3 index scores.[4]

Tear Osmolarity (Change from Baseline)



Tear Break Up Time (Change from Baseline)



Significant improvement in tear osmolarity

Omega-3 study subjects reported a significant improvement of occasional dry eye symptoms

Significant improvement in tear break-up time indicating a healthy lipid layer, less tear evaporation and tear film instability

1 Eldridge D. et al Presurgical hyperosmolarity and treatment predicts Refractive Outcomes. ARVO E-Abstract 1286, 2012
2 ASCRS Clinical Survey 2013
3 Expert Rev Ophthalmol. Oct 2011; 6(5): 575-582
4 Epitropoulos, Alice T, et al. Abstract Investigational Study, April 2015. (Abstract presented at ASCRS April 19, 2015) Effect of Oral Re-Esterified Omega-3 Nutritional Supplementation on Tear Osmolarity: Double-Masked Randomized Placebo Controlled Study
5 A. Epitropoulos, Refractice surgery for patients with Severe Dry Eye, Cataract & Refractive Surgery Today, March 2015
6 NH, Epithelial healing and visual outcomes of patients using omega-3 oral nutritional supplements before and after photorefractive keratectomy: a pilot study Cornea.2013 Jun;32
7 He J,Bazan HE.Omega-3 fatty acids in dry eye and corneal nerve regeneration after refractive surgery. Prostaglandins Leukot Essent Fatty Acids.2010;82(4-6):319-325.
8 E Holand, E Donnenfeld. Pre and Postoperative Cataract Care of Eyes with Inflammatory Disease. CRSTtoday, February 2012
9 Epitropoulos AE, Matossian C, Berdy GJ, et al. Effect of tear osmolarity on repeatability of keratometry for cataract surgery planning. J Cataract Refract Surg 2015; 41:1672-1677.