Feature of autonomic nerve activity during different eye conditions in dry eye with unstable tear film

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Purpose. Neurological abnormality has been suggested to be involved in the pathogenesis of dry eye (DE) disease. We previously reported that autonomic nerve activity (ANA) may be a key for the symptom manifestation in short break up time of tear film (BUT) DE (sBUTDE), which exhibits severe symptoms even with little epithelial damage (Kaido et al. Invest Ophthalmol Vis Sci. 2023). In this study, we investigated whether the cause of ANA modulation is peripheral or central.

Methods. This prospective, cross-sectional, comparative clinical study included 23 eyes of 23 patients with sBUTDE (mean age: 55.2 ±16.1 years), who were receiving conventional treatments, and 16 eyes of 16 non-DE controls (mean age: 55.4 ± 16.5 years). An ANA measurement and the Japanese version of the Ocular Surface Disease Index (J-OSDI) were administered. ANA was continuously measured for 10 min. under each of three conditions: eyes closed, eyes open, and eyes open under ocular surface anesthesia. The parameters were component of low-frequency (LF) reflecting cardiac sympathetic and parasympathetic nerve activity, high-frequency (HF) reflecting parasympathetic nerve activity alone, ration of LF over HF (LF/HF), component coefficient of variation (ccv) of LF (ccvLF), and ccvHF.

Results. In sBUTDEs, HF and ccvHF were higher when the eyes are open than when the eyes are closed; LF/HF was higher when the eyes are closed than when the eyes are open, whereas non-DEs showed the opposite response. The difference values of HF, ccvHF, and LF/HF between the eyes closed and open were greater in sBUTDE than in non-DE. There were no significant changes in all parameters between the open eyes with and without anesthesia in both groups. In addition, the multiple regression analysis

to determine the factors affecting J-OSDI scores with ANA parameters as independent variables showed that HF under eyes open was significantly associated with the J-OSDI scores.

Conclusion. The symptom manifestation in sBUTDE may be explained by abnormalities in ANA, and the fact that blockade of peripheral stimulation does not change ANA may suggest central involvement of ANA.