Visual Field Statistical Analysis Indices Collapse in End-State Glaucomatous Field Loss

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Purpose: Statistical analysis indices (Humphrey STATPAC, Humphrey-Zeiss, Dublin, California) guide our interpretation of static automated visual fields (VFs) and are an indispensable tool for interpreting both the extent of VF damage and its progression over time. However, in very advanced glaucomatous visual field loss, these indices may fail to reflect the true nature of the VF loss.
Methods: Fifteen eyes of 14 patients with end-stage glaucoma were identified at a tertiary glaucoma center, in whom evidence of VF statistical analysis indices collapse was present. End-stage glaucoma was defined as vertical cup-to-disc ratio of $>= 0.9$, mean deviation (MD) worse than -25dB, and only a central or temporal island remaining in the VF gray-scale. Collapse of statistical indices was defined as: pattern deviation probability plot lacking solid black squares (not a single location showing $p < 0.5\%$); corrected pattern standard deviation (CPSD) probability $<5\%$ or within normal limits (WNL); pattern standard deviation (PSD) probability $<5\%$ or WNL; short-term fluctuation (SF) probability WNL; glaucoma hemifield test (GHT) not "outside normal limits" (ONL); or false negative (FN) responses $> 40\%$ flagging the "low patient reliability" comment in the absence of other reliability criteria (both fixation losses (FL) and false negative (FN) responses, $> 90\%$).
Results: The pattern deviation probability plot was normal in 11/15 eyes. PSD, SF and CPSD were normal, or barely outside the normal range (at $p < 5\%$) in 13/15, 14/15 and 14/15 eyes respectively. The GHT was outside normal limits in only 6/15 eyes. Two additional eyes had a GHT that was considered "borderline" with generalized reduction of sensitivity (GRS) and in 3 additional eyes only GRS was noted. In 2/15 eyes an abnormal MD was the sole global index alerting to the extent of advanced VF damage. In 8/15 eyes "low patient reliability" was triggered solely due to a FN score of $>40\%$.
Conclusion: Statistical indices are crucial for the interpretation of automated static VFs. However, in end-stage glaucomatous VF loss, both the global statistical indices and the reliability indices on the printout may erroneously reflect the condition and introduce confusion to the casual observer. Furthermore, in these very advanced cases, global statistical indices might paradoxically appear normal.

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