Shall we count numbers of eyes or numbers of subjects?

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INTRODUCTION

In this paper we will try to answer the question: numbers of eyes or numbers of patients in relation to the semiotic study of the intraocular pressure.

Our attention was arisen by EDERER's Editorial (1973) that discussed this subject.

According to KAHN (1972) the correlation coefficient between right and left eyes of normal patients for the IOP is about 0.9: this fact means that if we consider both eyes in research analysis we would not have independent observations in our sample and then statistically it is more correct to consider only one eye of each patient and both as often found in ophthalmologic literature.

In this work we plan to analyse three groups of patients:

GROUP I — Normal patients

GROUP II — Glaucomatous patients without visual field defects

GROUP III — Glaucomatous patients with typical visual field loss

MATERIAL AND METHODS

The total sample was composed by 212 patients (86 males and 126 females) distributed in the following groups:

GROUP I — 120 patients with ages varying from 15 to 58 years, all of them with normal ophthalmologic examination (50 males and 70 females).

GROUP II — 63 glaucomatous patients without optic disc damage with ages varying from 11 to 77 years (21 males and 42 females).

GROUP III — 29 glaucomatous patients with optic disc damage in one or both eyes (typical visual field defects) with ages varying from 24 to 77 years (15 males and 14 females).

The study of the IOP included single tonometries, the determination of the tonographic coefficients and the daily curve of pressure (DCPo).

The DCPo was performed through the applanation tonometer (the 6 A.M. measurement was performed in the bed with the hand applanation tonometer — Draeger or Perkins tonometers). Two parameters were considered in the DCPo as established by SAMPAOLESI (1961), i.e., the arithmetic mean and the standard deviation of the seven measurements.

The tonographies were obtained with the Schwartzer (Van Beuningen) or the Crescent Electronic Tonometers.

The kinetic visual fields were obtained in the Goldmann Perimeter (Mod. 940 by Haag-Streit).

The ophthalmoscopic examination was performed with the Bausch and Lomb direct binocular ophthalmoscope.

We calculated the Pearson's correlation coefficient between right and left eyes, for the tonographic coefficients and for the two parameter of the DCPo in each group.

The significance of the correlation coefficients was tested.

We also calculated the t test for correlated samples (paired t) for all the considered parameters in each group.

The adopted level of significance was $\alpha = 0.05$. The calculations were made with the Calculator S 61 — Statistician, by Commodore.

RESULTS

The results of groups I, II and III are presented on Tables 1 to 3, respectively.

In the normal group (table I) all the correlation coefficients were significantly different from zero ($p < 0.001$) and the differences between right and left eyes, tested by the paired t were not significant.

In group II (table 2) the results were closely similar to the normal group with one exception: the differences between right and left eyes were significant for the F values and the correlation was not so good.

In group III (table 3) all the correlation coefficients were not significantly different from zero, i.e., the correlation between right and left eye measurements was not good.

Comparing the correlation coefficients between right and left eyes in relation to the DCPo in the three groups we found:

1 — In group I the r value was aroud 0.9 (this result was very close to that of KAHN, 1973).

TABLE 1 — Normal group

		n	RIGHT EYE Mean	RIGHT EYE S.D.	LEFT EYE Mean	LEFT EYE S.D.	r	p<	t	p<
Tonography	C_{0-4}	120	0.33	0.09	0.34	0.09	0.49	0.001	—0.85	—
	F	120	2.21	1.12	2.30	1.24	0.58	0.001	—0.65	—
	C_{3-7}	120	0.19	0.04	0.19	0.03	0.42	0.001	0.55	—
Daily Curve of IOP	Mean	43	12.86	1.63	12.86	1.61	0.95	0.001	0.05	—
	sd	43	1.45	0.45	1.39	0.40	0.81	0.001	1.54	—

TABLE 2 — Glaucomatous patients without optic nerve damage

		n	RIGHT EYE Mean	RIGHT EYE S.D.	LEFT EYE Mean	LEFT EYE S.D.	r	p<	t	p<
Tonography	C_{0-4}	63	0.22	0.11	0.21	0.10	0.65	0.001	0.72	—
	F	63	2.46	1.64	2.09	1.08	0.38	0.01	1.89	0.05
	C_{3-7}	63	0.10	0.05	0.10	0.06	0.67	0.001	—0.30	—
Daily Curve of IOP	Mean	63	19.80	3.20	19.80	3.37	0.70	0.001	—0.02	—
	sd	63	2.80	0.90	2.78	0.92	0.70	0.001	0.26	—

TABLE 3 — Glacomatous patients with optic nerve damage

		n	RIGHT EYE Mean	RIGHT EYE S.D.	LEFT EYE Mean	LEFT EYE S.D.	r	p<	t	p<
Tonography	C_{0-4}	18	0.14	0.12	0.10	0.07	0.17	—	1.39	—
	F	18	1.82	1.18	1.44	0.90	0.09	—	1.13	—
	C_{3-7}	15	0.05	0.03	0.04	0.02	0.33	—	1.26	—
Daily Curve of IOP	Mean	29	25.09	7.19	26.88	6.54	0.33	—	—1.20	—
	sd	29	3.45	1.58	3.66	1.38	0.29	—	—0.66	—

2 — In group II and III the r value decreased progressively: Group II r = 0.70; group III r = 0.30.

In relation to the tonographic coefficients the behavior of group I and group II was similar, but group III showed lower r coefficients.

COMMENTS

Our results obtained in groups I and II are in accordance to EDERER's conclusions: in normal patients we must consider only one eye of each patient in the semiologic study of the Po. In other words, it is more correct to consider "number of patients" instead of "number of eyes". Due to the close correlation between right and left eyes of normal patients if we considered both eyes we would have a larger sample than it is in reality, i.e., we would be considering each patient more than once. On the other hand, we can take advantage from the high r values in comparative studies of two experimental treatments, one applied to the right and the other to left eye. Due to the similar behavior of both eyes even small differences in their responses can be significant.

The results of group III showed low r coefficients, statistically not different from zero. This fact shows that glaucoma is an assymetric disease and that the behavior of the considered parameters are independent between both eyes. It means that these patients are not so good for comparative studies as those from groups I and II, as discussed above. Despite the low r coefficient, we cannot say that the right eye is independent from the left eye in these patients, especially because our sample is not large and because it gathers two classes of patients: those with unilateral and those with bilateral field loss.

In relation to the paired t an interesting fact occurred: we did not find significant differences between right and left eyes in group III for all the considered parameters in spite of the assymetry of the disease in the two eyes. Probably we can find the explanation in the fact that the differences between both eyes occurred in opposite directions among the patients neutralizing each other and leading to small paired-t values.

We must emphasize that group III is smaller than groups I and II and perhaps with a bigger sample the r coefficients could be significantly different from zero, even being lower than those from groups I and II.

We can conclude:

1 — The correlation between right and left eyes for the DCPo parameters is greater in the normal group, decreasing progressively in group II (glaucomatous patients without optic nerve damage) and group III (glaucomatous patients with optic nerve damage).

2 — The correlation between right and left eyes in relation to the tonographic coefficients is similar in groups I (normal) and II.

3 — The results of groups I and II are in accordance to EDERER's conclusions (1973): it is more correct to consider the number of patients than the number of eyes in semiologic studies of the intraocular pressure. On the other hand, due to the positive correlation between both eyes, they are good for comparative studies of the response of each one to different experimental procedures as, for example, the hypotensive effect of two different drugs, one applied to the right and the other to the left eye of each patient.

4 — In glaucomatous patients with typical visual field loss in one or both eyes the correlation between both eyes are not so good for comparative studies as stated above.

REFERENCES

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SUMMARY

The question of considering both eyes of each patient or only one in the analysis of glaucoma research was analysed. Three sample groups were considered: (1) normal patients; (2) glaucomatous patients without visual field defects; (3) glaucomatous patients with typical visual field loss. The correlation coefficient between both eyes was statiscally significant for the daily curve of intraocular pressure parameters and for the tonographic coefficients in the first and second groups.

Therefore, it is more correct to consider only one eye of each patient in the analysis of the data from normal patients or glaucomatous patients without visual field defects, i.e., it is more correct to consider the number of subjects than the number of eyes in these groups.