

The Pulsair-Keeler non-contact tonometer in self-tonometry: preliminary results

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Abstract

The authors considered the possibility of using the Pulsair-Keeler non-contact tonometer in self-tonometry.

For this reason, 45 patients have been trained to use the instrument and, after a reasonable trial period, were able to self-measure their IOP.

The results have been compared to the tonometric values measured with Goldmann tonometer to evaluate statistically the limits and the dependability of this method of measurement.

The results shows that self-tonometry with the Pulsair-Keeler tonometer can be used in monitoring glaucomatous patients at home.

Introduction

Home monitoring of chronic diseases is clinically important in various branches of medicine (cardiology, diabetology, etc.). In the ophthalmic field, circadian control of the intra-ocular pressure (I.O.P.) in glaucoma patients is of fundamental importance in evaluating the state of the disease and the effectiveness of the therapy employed. There have been, in the past, numerous studies into the possibility of home tonometry, both with the use of traditional tonometers (Schiotz's), which require another person's help [4, 6], and with instruments the patient himself can use [7–9].

It has been our objective to investigate the possibility of using the Pulsair-Keeler pneumatic tonometer with its special operational features which make it particularly suitable for self-assessment.

Materials and methods

The Pulsair-Keeler tonometer is a non-contact, automatic measuring instrument composed of a central compressor unit and a movable part containing the measuring system. With the movable part correctly positioned at about 2 cm from the corneal apex, the tonometer automatically, by means of its luminous points, measures the I.O.P., the value of which is read on the display. We have proven that the tonometer can be used by the individual without the help of other people (Fig. 1).

Forty-five patients aged between 37 and 77 years with good enough eye sight to perceive the fixation points, have taken part in self-tonometry. The total number of eyes was 90. The subjects were shown how to use the instrument, practised for a short-session and then invited to carry out a complete self-tonometry consisting of 4 measurements per eyes not exceeding a 5 minute period. The means of the results were then compared with the I.O.P.



Fig. 1. Self-tonometry.

values obtained immediately afterward with the Goldmann tonometer.

Results

Self-measurement of ocular pressure was achieved in 75 per cent of the cases with the incidence of failure being higher in patients over 60 years of age (Table 1). The mean I.O.P. value found with the Pulsair-Keeler tonometer was 15.5 mmHg, while that found with the Goldmann tonometer was 16.3 mmHg (Student's t-test, $p = 0.29$).

Figure 2 shows the difference in mmHg between the two tonometer findings in the same patient. It is clear that in 73 per cent of the cases, the difference was contained within 1 mmHg (Table 2).

Conclusions

The present results indicate that self-tonometry can be performed with sufficient reliability with the Pulsair-Keeler non-contact tonometer, and with-

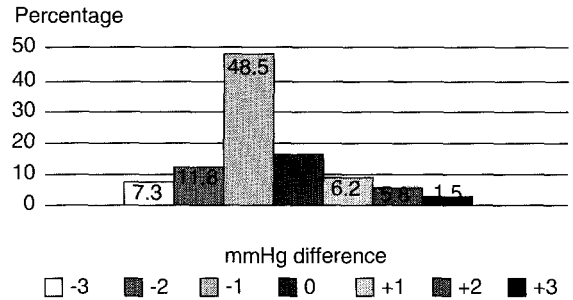


Fig. 2. Pressure difference between the Pulsair-Keeler non-contact tonometer and Goldmann tonometer.

out any side effects. Other considerations have also emerged. Firstly, the difference in the IOPs as found by the two tonometers agrees with that published elsewhere where the non-contact tonometer had been used by trained personnel [1, 2, 3] and therefore confirms the validity of the automatic system which limits the operator's influence on the results (Table 2). Secondly, there is the advantage of low bacterial or viral contamination risk, common in all non-contact tonometers [5], which is of particular importance in home tonometry.

On the other hand, the drawbacks of the Pulsair-Keeler tonometer lie in its initial cost and in the inability of 25 per cent of patients to carry out their own tonometry. This points to the need of good subject cooperation or the initial help of another capable person. However, in many cases of well-chosen glaucomatous subjects, self-tonometry with the Pulsair-Keeler non-contact tonometer may be proposed for monitoring the circadian pressure curve in relationship to the therapy progress. The results are evaluated in parallel with the traditional clinical data.

Table 1. Self-tonometry.

	No. of eyes	Successes	Failures
Total	(90 eyes)	75%	25%
Patients under 60 years	(40 eyes)	80%	20%
Patients over 60 years	(50 eyes)	72%	28%

Table 2. Results of Keeler and Goldmann tonometers.

Eye No.	Keeler	Goldmann	Eye No.	Keeler	Goldmann
01	10	10	35	15	17
02	20	20	36	15.2	16
03	15	15	37	14.5	15
04	17	17	38	13.5	14
05	18	18	39	12	13
06	16	16	40	16	17
07	19	19	41	11.2	12
08	12	12	42	12	13
09	21	12	43	11	12
10	18	18	44	17	18
11	13	13	45	18.7	19
12	15.7	15	46	19	20
13	16.5	16	47	16.5	17
14	17.7	17	48	19	20
15	15	14	49	14.7	15
16	10.5	10	50	18	19
17	15.2	15	51	12.5	13
18	20.7	20	52	10	11
19	18	16	53	10	11
20	14.7	13	54	15	16
21	17.7	15	55	16.2	17
22	20	17	56	13	14
23	14.2	17	57	20	21
24	10.2	13	58	10	11
25	15	18	59	19.2	20
26	21.2	24	60	18	19
27	19.5	22	61	15.5	16
28	17.5	19	62	10	11
29	16.2	18	63	18	19
30	16	18	64	17	18
31	10.5	12	65	24	25
32	12	14	66	16.2	17
33	13	15	67	19	20
34	14.2	16	68	22.2	23

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