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Short Communication

MyVisualField©Static Test The Visual Field test Performed with a Smartphone and a Virtual Reality visor

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Abstract

Glaucoma is a progressive optic neuropathy characterized by loss of retinal ganglion cells (RGCs) and typical visual field defects. With more than 60 million people affected, it is nowadays considered a leading cause of irreversible blindness worldwide [1,2]. The goal of glaucoma management is to preserve the patient's quality of life [3,4].

The rescheduling of work in hospital eye units during the COVID 19 pandemic has led to the prioritization of emergency operations and clinical work which cannot be postponed. This has consequently led to the cancellation or the postponement of a very high number of check-ups and tests which normally constitute follow-ups in cases of glaucoma and other chronic conditions. Online medicine and remote diagnostics have been under discussion for many years in view of the scarcity of specialist health workers available to perform check-ups and tests involving the use of medical equipment. The recent COVID 19 pandemic has underlined that today more

than ever, online medicine is essential both for diagnostics and for follow-up.

Visual field examination is the standard for care in evaluating disease progression, and for clinicians it represents the driver for adjusting the management of the patient [5].

The MVF Static Test represents an evolutionary step forward from the previous MVF cinetic [6,7] and is a simple and inexpensive device for the detection of visual field defects for use by either patients themselves or by general practitioners.

Objective

The aim of this study is to assess the possibility of using virtual reality to create a perimetric test which is usable by means of a mobile APP while retaining the essential elements of perimetry. Our aim was also to create an inexpensive test which is user-friendly for both patients and non-specialist healthcare staff for use either in the home or in general practice surgeries.

Methods

Under study were 65 volunteers between 23 and 88 years of age (130 eyes analyzed): 20 healthy patients with normal, standard visual fields, 5 patients with circulatory conditions and affected by hemianopia, and 40 glaucoma sufferers.

- Smartphone 5-inch touchscreen display (Android or iOS) with 1080x1920 pixel resolution.
- MVF (MyVisualField) static test APP installed on the smartphone.
- Bluetooth remote control equipped with a button compatible with Android and iOS smartphones.
- Zeiss VR ONE Plus virtual reality visor - Android and iOS smartphones equipped with 4.5–5.5-inch displays.

All of the participants underwent a visual field test with Sita 30-2 SITA Humphrey, 24-2 SITA Humphrey, or FDT Matrix programmes, before carrying out the tests with MyVisualField (MVF). At the conclusion of the test they were given a brief questionnaire.

Results

- The MyVisualField (MVF) test simulates a static perimetry test, using a fixed focal point and light targets of varying intensity.
- The luminosity problem with MVF is resolved, as with automated perimetry devices, by using a logarithmic scale. The production of the light stimuli is achieved through colour modulation by means of the RGB scale.
- Every test carried out with MyVisualField APP generates a graphic in real time on the mobile phone, which can be both exported and printed.
- Visual field tests carried out with MVF have an average duration (depending on the nature of the test) of around 1 to 2 minutes. Figures (1, 2, 3, 4).

Figure 1: The printout of MVF static test and FDT Matrix in a patient with moderate glaucoma

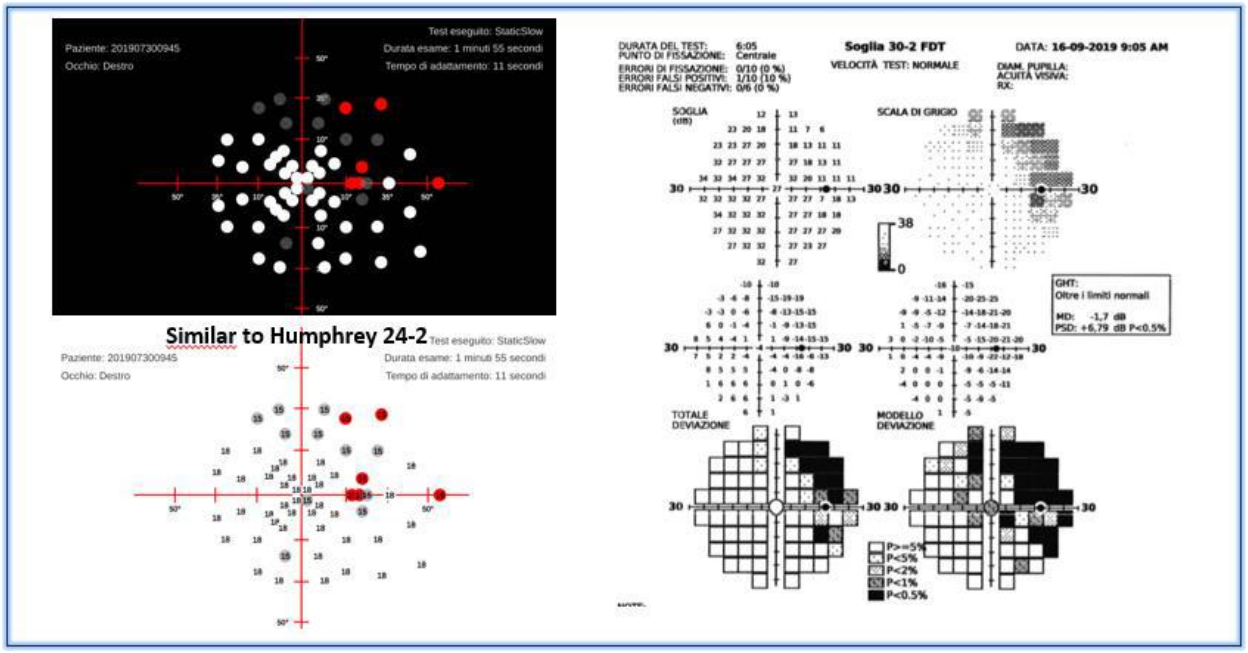


Figure 2: The printout of MVF static test and Humphrey Visual Field in a patient with moderate glaucoma and paracentral defect

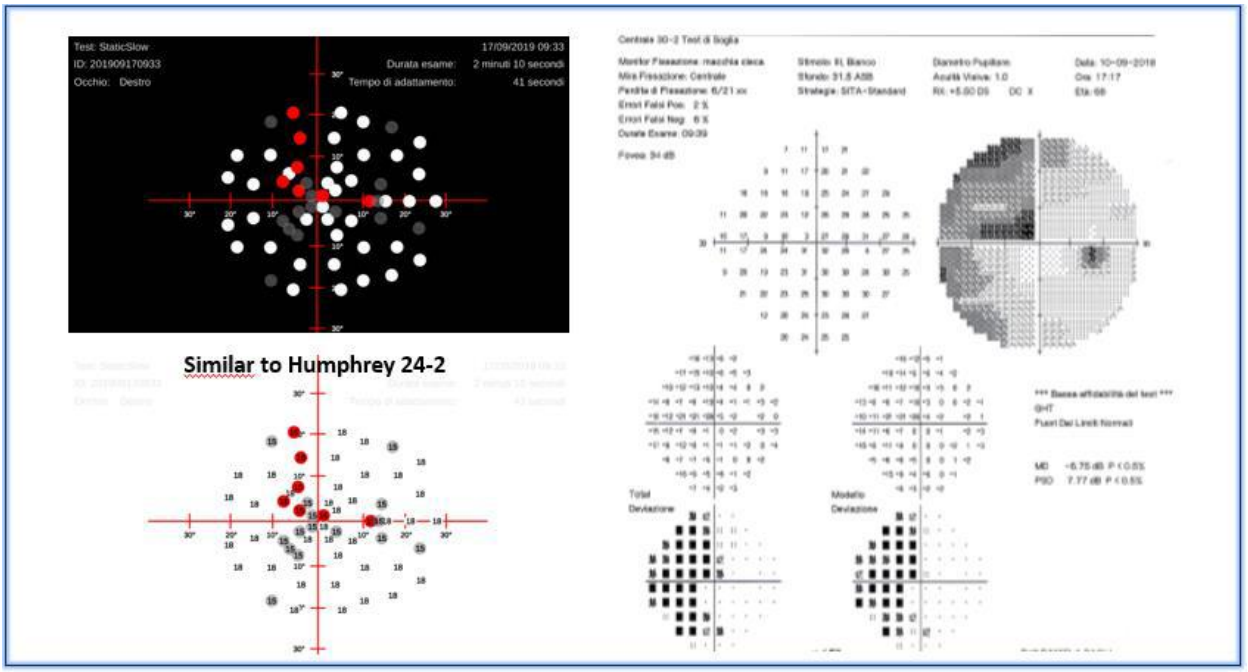


Figure 3: The printout of MVF static test and Humphrey Visual Field in a patient with sector-shaped defect elsewere in the visual field

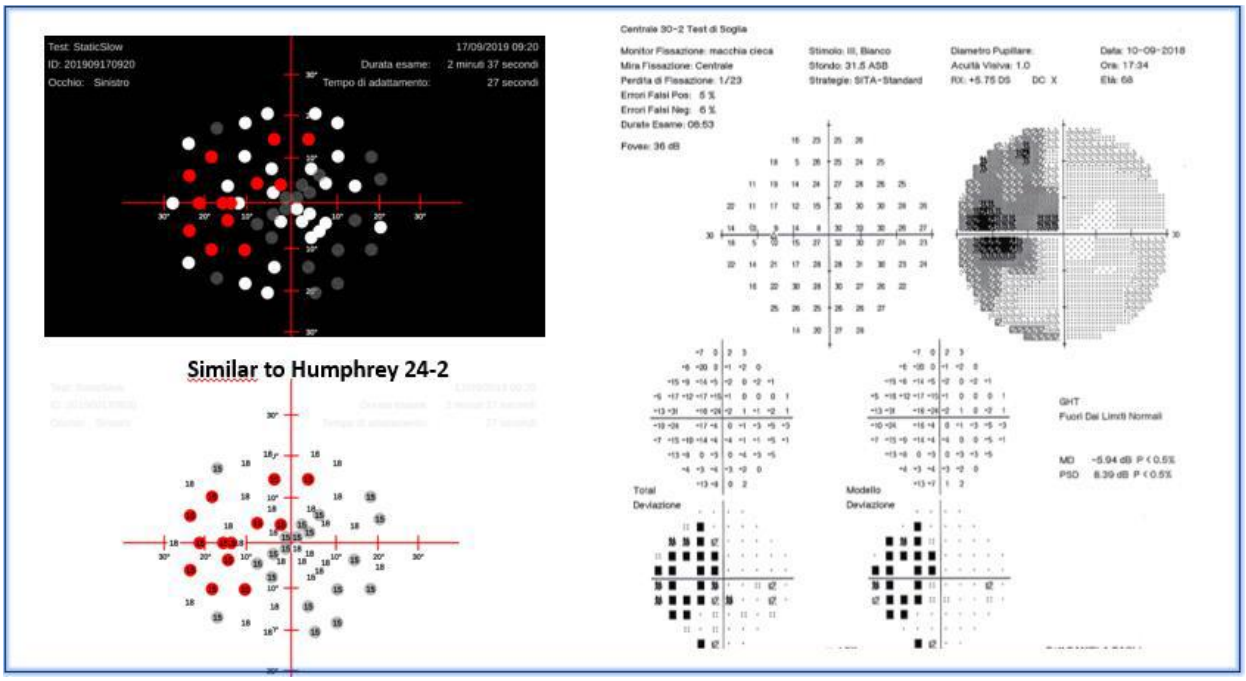
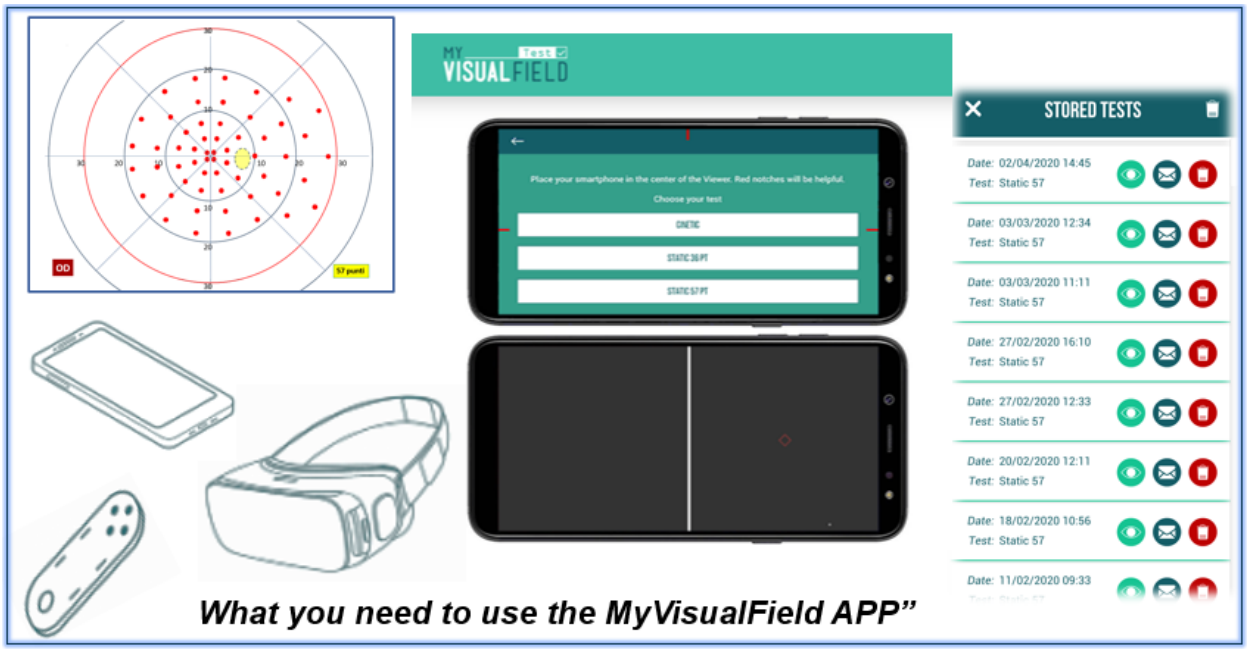


Figure 4: The MVF headset with the response button and the WebApp



Conclusions

MVF requires virtually no instrument or patient set-up and no use of trial lenses. Any staff member or any patient can operate MVF with very little training. Screening tests are performed in less than one or two minutes, set-up time is minimal, test times are short and results are easy to understand. The easily transportable MVF fits neatly into the pre-test area.

For patients with defects, the test was shown to be a useful counterpart to traditional methods. Many of the difficulties reported by the patients were associated with the sensitivity of the remote control. Notwithstanding the limits imposed by the system not having been certified for clinical use, the set objectives - which were to use virtual reality to carry out a test which provides a graphic readout of sensitivity and the difference between diseased and normal – were achieved.

By managing glaucoma and effectively delaying disease progression, we should expect to significantly reduce the economic burden of this disease.

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