The Treatment of Migraine with Variable Frequency Photo-Stimulation

D.J. Anderson, B.Sc., M.B., B.S.

SYNOPSIS
Variable Frequency Photo-stimulation (VFP) goggles are a form of portable stroboscope, using red Light Emitting Diodes to alternately illuminate the right and left eyes, with the eyelids closed, at a rate of 0.5 to 50 Hz. VFP goggles were used in the treatment of 7 patients with migraine headache. Of the 50 migraine headaches reported, 49 were rated by the patient as being helped and 36 as being stopped by using the VFP goggles. Treatment reduced the median duration of the headache in all patients. The interval between migraine headaches appeared to increased in the two cases with follow up of more than 18 months. We conclude in this preliminary study that VFP appears to be effective in the treatment of migraine.

INTRODUCTION
VFP goggles consist of a pair of goggles, similar to swimming goggles, using red Light Emitting Diodes (LEDs) to alternately illuminate the right and left eyes, with the eyelids closed, at a rate of 0.5 to 50 Hz per eye. The eyelids are closed because the LEDs have to use a narrow angle of illumination (70 degrees) and the eyelids act to diffuse the light. The goggles are connected to a small battery powered control box by means of which the user can control the frequency and intensity of illumination. The mark space ratio is 50% independent of frequency. The light output from the LEDs is adjustable in the range of 10 to 500 millicandela. A pilot study was carried out using VFP on 7 patients in conjunction with the Pain Clinic at Coleraine Hospital, The Psychology Department at The Queen Elizabeth Military Hospital and a North Yorkshire General Practice.

METHOD
The patients all presented with long-standing migraine headaches. Migraine was diagnosed using the definition of Blau. “Episodic headache lasting from 2 to 72 hours with total freedom between attacks. The headaches must be associated with visual or gastrointestinal disturbance or both. The visual symptoms occur as an aura before and/or photo phobia during the headache phase. If there are no visual but alimentary disturbances, then vomiting must feature in some of the attacks.” (Blau, 1984)
Patients were questioned as to their previous history of migraine and only those with a history of at least five years were included. Any patient with a history of epilepsy was excluded as a precaution, it being known that epileptic fits can be provoked by stroboscopic light. Underlying pathology was excluded by physical examination. No patient had achieved satisfactory control of symptoms with drug therapy. Patients were given a pair of VFP goggles to take away and their use was explained. They were asked to use them at the onset of their symptoms and to adjust the frequency and intensity of illumination for comfort. The patient’s informed consent was obtained. They were asked to keep a record of their headache activity and use of the VFP goggles together with the effect the VFP goggles had. Follow up was then arranged. Two patients have been followed up over two years.

RESULTS

Seven patients (5 female, 2 male) aged 26 to 57 years (median age 42 years) were treated with the VFP goggles. The median time since the first migraine headache was 20 years (range 8 to 45 years). Median migraine frequency was 6 per month (range 1 per day to 1 per month).

Fifty migraines were recorded. Forty-nine of these were rated by the patients as being “helped” by using the VFP goggles. Thirty-six of the migraines were rated as being “stopped” by using the VFP goggles.

Median duration of use of the VFP goggles was 30 minutes (range 5 to 60 minutes). The reported duration of the migraine headaches without treatment was 6 hours (range 4 to 48 hours). The median duration of migraine using the VFP goggles was 35 minutes (range 5 minutes to 6 hours). A Wilcoxon matched pairs test was carried out to compare this data. The reduction in duration of migraine headache was significant within this small group (P<0.02).

Clearly further studies of a larger group would be required to confirm these findings. The interval between successive migraine headaches was calculated in the two cases with a follow up of more than 18 months (Figure 1). It would appear that there may be a trend of increasing...
intervals between migraines with repeated use of the goggles. No adverse reactions were reported. The patients described the effect of using the VFP goggles as calming and relaxing.

**COMMENT**

A preliminary study of a slow wave photic stimulation in the treatment of headache reported relief of muscle contraction headaches but no relief of migraine (Solomon 1985). The Dzidra Glass in that trial was used for 5 minutes and the author speculated that longer treatment periods might improve results. The findings described in this present study suggest that longer treatment periods are effective in the treatment of migraine headache, patients using the VFP goggles for a median of 30 minutes.

Other factors may have contributed to the difference in findings. The Dzidra Glass operates in the frequency range of 1 to 3 Hz, whilst the VFP goggles operate in the frequency range of 0.5 to 50 Hz. Patients report using the VFP goggles in the higher frequency range, and that relief is more rapid when they do so.

Patients tended to use the VFP goggles at the brightest setting. At one stage a set of VFP goggles producing a lower intensity of illumination was substituted in two of the cases. Both reported an increase in the time taken to stop the migraine headaches. When the higher intensity of illumination model was used again, relief took a shorter time.

The patient controls the frequency and intensity of illumination and this is a factor which should be investigated further.

The mechanism of action of the VFP goggles on the migraine headaches remains unknown. Red stroboscopic light tends to produce rapid and powerful alpha brain rhythms in the occipital cortex (Lewis 1986). The VFP goggles have a similar effect. (Anderson unpublished observations). Alpha enhancement autogenic training has been used in the treatment of migraine with a reduction in the number of migraine headaches per week but with no change in the intensity, duration or disability of the headache (Cohen et al. 1980). A causal relationship between the induction of the occipital alpha rhythm and the stopping of a migraine headache, once started, has not been established.

This pilot study showed good efficacy for the VFP goggles in the treatment of migraine headache in a limited number of patients. Clearly further studies are required to confirm this preliminary study in a placebo controlled manner.
Acknowledgments: Thanks are due to Dr. W.J. Love and Dr. A.D. Mone for permission to include results from their patients in this paper and to Dr. P. Canfield for his valuable advice.

REFERENCES

