

PRESS-ON PRISMS

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The author's interest in the therapeutic use of prisms was first aroused about twenty years ago by Dr. Gregory Flynn who used them in the treatment of post-operative convergence in overcorrected intermittent divergent squint. He slightly undercorrected the deviation with prisms fitted to the patients' glasses with special clip-on frames. The patient was seen daily by the orthoptist who gave fusional vergence treatment. She gave details of the smallest fusion angle to Dr. Flynn who then saw the patient and, if possible, reduced the strength of the prism correction. The difficulty with this type of treatment, especially for an orthoptist in private practice is that a large collection both of prisms and various clip-ons to fit spectacles of different types and sizes are necessary. As spectacles became more varied in shape this proved an almost insurmountable barrier and when many children objected to wearing the clip-ons because of their weight and appearance this type of treatment was largely abandoned.

In 1967 while the author was abroad she was impressed with the treatment at Marburg and Geissen in Western Germany in which prisms were used for patients who were hospitalised awaiting surgery. These were round glass prisms without frames and were taped onto the patient's glasses with sticking plaster. The weight of the glasses was then so great that the patients had to have the nose piece strapped to their foreheads, to keep the glasses from slipping down too far. The patient's angle of deviation was neutralised by the prisms and this was checked regularly to see if the angle had increased or decreased. The prisms were changed as it became necessary and the patients were given every chance to use binocular single vision. Because of the very unusual appearance of the children, while undergoing this form of treatment, and because of the need for frequent change in the strength of the prism, the author reluctantly decided that this form of treatment was feasible only with live-in patients, in spite of its obvious advantages. However, on visiting the United States of America that same year, she found that many orthoptists were using a new form of prism, known as the wafer prism, which was much lighter to wear. These proved to be expensive and also had to be taped onto the patient's glasses. Enthusiasm waned somewhat, although it was obvious that there was much successful work being done abroad with prisms.

During a congress in San Francisco in April, 1971, interest was again aroused on hearing Fletcher Woodward, an American orthoptist, talk about the prism adaptation test, (P.A.T.). Dr. Thorsen then spoke about the new press-on prisms, giving a demonstration of the method of applying these to the patient's spectacles. Those attending the congress were given the opportunity to practise applying the prisms and using a pantograph to cut the prism to the shape of the lens. With a little practice this proved quite easy.

These press-on prisms are an adaptation of the original lenses designed for lighthouses by Augustin Fresnel in the early nineteenth century. The adaptation has been made possible by the development of modern plastics. A membrane Fresnel prism resembles a series of small plastic prisms lying adjacent to each other on a thin platform of plastic.

To apply the prism:

- i) From the large membrane as supplied, cut the required portion to fit the lens shape. This is done most easily with a pantograph.
- ii) Before placing the prism on the lens, clean both the prism and the glasses with detergent and dry with a lint free towel. There must be no grease or dust on either surface.

- iii) Hold the prism and the glasses under running water and apply the prism to the back face of the patient's glasses, placing the flat side of the prism against the lens, taking care to place the base in the correct direction and placing the prism symmetrically.

The prism may reduce the patient's visual acuity by about one line of Snellen's chart and so it is often advisable to place the prism in front of the fixing or preferred eye to discourage suppression of the usually suppressing eye. However, since the largest prism available is about 30 prism dioptres, it will often be necessary, especially in larger deviations, to divide the amount of prism between the two eyes.

Use of Press-on Prisms

The main therapeutic use of prisms is to facilitate the use of bi-foveal fixation. This can be for permanent or temporary use.

A. Permanent Use.

The criteria for use are the same as for normal prisms. The advantage of the press-on prisms is that they are lighter and so may be used in cases where large prisms are needed. They may be used for heterophoria or strabismus and are especially helpful for cases of vertical deviation. In incomitant squint where there is the problem of the angle varying in the different directions of gaze, some experimental work has been done where strips of prisms of varying strength are placed in three or four zones on the patient's glasses and this has proved beneficial in eliminating diplopia.

B. Temporary Use.

- i) The pre-operative prism adaptation test (P.A.T.) is one of the main uses for these prisms. This test counteracts the angle of deviation, as measured for distance with the prism cover test. The patient is checked after wearing the prisms for at least an hour, to see if there is any change in the angle. There may be three reactions:-
 - (a) The angle may stay the same, allowing the patient to use bi-foveal fixation pre-operatively.
 - (b) The angle may be reduced. That is while wearing the prisms the eye may show an exophoric movement when tested for distance fixation. In this case the prisms should be suitably reduced and the patient tested again later. It is possible, but not expected, that in these cases the angle will gradually reduce until orthophoria is reached without prisms. In other cases it is advised that the smallest angle found by this method is the one on which surgery should be performed. It seems that these cases may be those who, if fully corrected, would diverge post-operatively.
 - (c) The angle may increase. This often happens quickly and these patients may be those whose deviation would increase again, perhaps even to the original angle of deviation, following surgery. This can be readily explained in cases with abnormal retinal correspondence and such cases, if the angle of deviation is not too large, may be better left without surgery. It is not understood so readily why other cases without an abnormal retinal correspondence increase the angle again post-operatively but it may be due to lack of fusion. Some authorities recommend increasing the prisms until the maximum angle is found and then performing surgery on this maximum angle.
 - (d) A vertical deviation may become apparent which was not present before. This may be a means of avoiding the use of binocular single vision or may be a deviation which should be considered by the surgeon. If the horizontal prism

is placed at an angle instead of symmetrically a vertical deviation may be corrected as well.

The prism adaptation test should be performed on all cases before surgery. If the patient used bi-foveal fixation and single binocular vision with the prisms they should be maintained on the glasses until surgery is performed. This will give the patient a reasonable period of bi-foveal experience in free space before surgery and it is hoped that this experience will facilitate the use of binocular single vision post-operatively. If the patient does not obtain bi-foveal fixation with the prisms, at least the test will have been useful in allowing the surgeon to judge possible post-operative reactions.

- ii) Post-operatively there are several uses for prisms.
 - (a) Dr. Thorsen in his talk said that in cases of convergent squint where the angle was not completely corrected by surgery and a small residual convergent angle remained, prisms to overcorrect the angle should be used at once. He reasons that this will give the patient diplopia, as it throws the image of the fixation object on to a part of the retina of the squinting eye which is out of the suppression area. The prism worn must produce an exophoric movement, thus the patient has made a convergence effort to obtain fusion. If this occurs and the patient starts to use bi-foveal fixation with the prisms these are gradually reduced, checking all the time to ensure that bi-foveal fixation remains, until they are removed altogether and the patient's eyes remain straight.
 - (b) In cases of intermittent divergent squint where there is a convergent angle post-operatively, this angle should be almost counteracted leaving a small amount, about three prism dioptres, of esophoria. This remaining deviation should be able to be overcome by diverging. If the patient is able to do this and returns next day with no movement on cover test, then the prism correction should be reduced immediately by three to five prism dioptres. This is continued until the prisms are eliminated altogether.
- iii) In cases of paralytic squint where the patient is unable to obtain single vision in any direction of gaze, he may be given single vision in the primary position by using prisms. These must be reduced as soon as possible if spontaneous recovery is occurring.
- iv) In cases with a constant convergent squint with an accommodative element especially those with an abnormally high A.C./A. ratio, prisms may be used in different strengths for near and distance by using different amounts on the upper and lower segments of the lens. A prism may be used on the lower half only if the patient can use binocular single vision for distance but is always convergent for near.
- v) In France and Germany work has been done with prisms in the treatment of abnormal retinal correspondence and eccentric fixation. As most of the literature on this is not in English, the author is not familiar with the methods used.

Summary

These new prisms which are comparatively easy to apply and are light and inconspicuous from the wearer's point of view open up a new field of endeavour in the orthoptic world. It is important that orthoptists should reassess all patients with a view to this form of treatment, and should be prepared to experiment with the use of prisms in the treatment of such problems as eccentric fixation, abnormal retinal correspondence and maybe even fixation disparity. Orthoptists can give the ophthalmic surgeon much information pre-operatively with the use of the prism adaptation test.