

INFANT ESOTROPIA: PILOCARPINE TREATMENT

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Abstract

A review of 263 cases of infant esotropia presenting over a 10 year period and treated with pilocarpine alone or pilocarpine in combination with standard therapy revealed an unusual proportion of fully binocular results.

Key Words

Infant esotropia, miotic therapy, pilocarpine, early treatment, survey, results.

INTRODUCTION

In 1977 a retrospective survey of all infant cases seen in a solo orthoptic practice over the previous 25 years was undertaken and the results showed an increase in the proportion of very young children examined and treated, and a rise in the proportion of fully functional results¹.

There was a fall in the proportion of large angle strabismus cases which was attributed to earlier detection of the strabismus while the deviation was still small and/or intermittent and, to a lesser extent, to improved methods of treatment, involving miotics and less use of glasses and surgery.

The purpose of this paper is to discuss the cases which had miotic drops solely or as a part of their treatment regime. There were 263 such cases out of a total of 750 infants seen. These cases presented between 1967 and 1976 and all had an esotropia.

The earliest use of miotics was reported in 1892² although eserine was suggested as far back as 1870³. In 1949, with the work of Abraham⁴ miotic therapy became popular. Many studies were undertaken and have been reviewed by Goldstein in 1968⁵.

The problem has been to find a miotic which could be used without undue side effects especially in very young children over a long period of time and which would be sufficiently long acting to be useful in strabismus.

Side effects of D.F.P. (di-isopropylfluorophosphate) and phospholine iodide (eothiopate iodide), which are in the anticholinesterase group

of drugs, include blurring of vision, ciliary injection, headaches, iris cysts, cataract formation and the dangers of concurrent scolone-type anaesthesia. These drugs are thus unsuitable although they have a long action which would be an asset. Pilocarpine, a much milder miotic, acting directly on the parasympathetic effector cell, had lost favour because its effect is often erratic and too short acting in its usual presentation⁶. However, pilocarpine is now available in vehicles such as polyvinyl alcohol and hydroxypropyl methylcellulose which have enhanced its effect in strabismus therapy (as well as in glaucoma) by prolonging its effect even at low concentrations. Pilocarpine in a mixture of long-chain polymers (adsorbobase) will soon be available and promises to be even better.^{7,8 and 9}

Pilocarpine in polyvinyl alcohol base was used most often in this series. Some children who preferred the methylcellulose base used it. No child had treatment suspended because of side effects or inability of the parents to carry out the routine instillations.

SUBJECTS AND METHODS

Between 1967 and 1976, 263 esotropic infants under 36 months of age at initial examination were treated with pilocarpine drops. In 130 cases this was the only treatment and in 134 it was only part of their treatment. There were 137 males and 126 females; 32% (84) had large angle ($> 12^\circ$) esotropia and 68% (179) had small angle and/or intermittent esotropia.

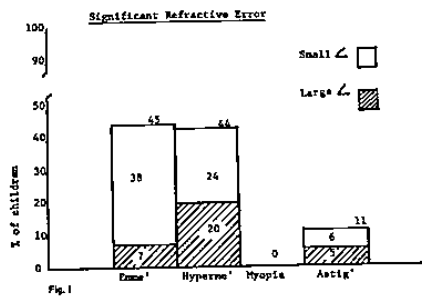


FIGURE I
Significant Refractive Error

Hypermetropia and emmetropia accounted for almost equal numbers of cases (44% and 45%). 11% had significant astigmatism. No cases of myopia were recorded. (Figure 1.)

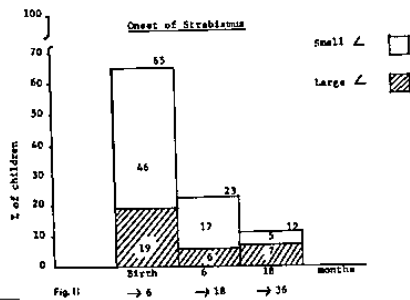


FIGURE II
Onset of Strabismus

Analysis of the onset of the strabismus (Figure II) shows a high incidence in the birth to 6 months age group (65%) even in the small/intermittent cases.

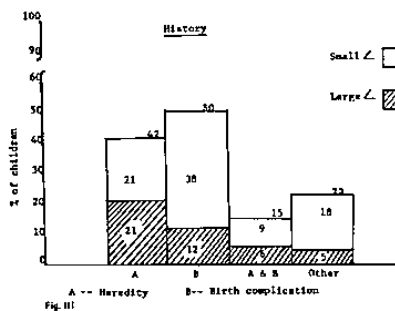


FIGURE III
History

In view of this finding, history of heredity and birth complications were studied (Figure III).

Birth complications, including prematurity, difficult delivery, long labour, rapid delivery, anoxia and factors which the parents and referring doctors considered to be significantly abnormal, occurred in 50% of cases. There was a familial history in 42% of cases. However, the combination of both factors was only evident in 15% of cases.

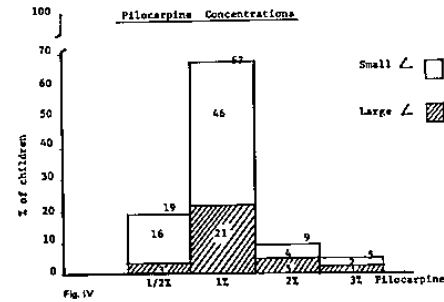


FIGURE IV
Pilocarpine Concentrations

Figure IV illustrates the concentrations of pilocarpine used. 1% was the most usual strength.

Infants were first prescribed 0.5% pilocarpine in polyvinyl alcohol for daily instillation on waking. This was soon increased to a twice a day routine. Strength was increased if necessary and occasionally the drops were used three times daily for short periods, during stress such as teething.

Other methods of treatment were included where necessary such as part time occlusion for amblyopia, glasses and surgery. The aim in each individual case was to achieve straight eyes during all waking hours as soon as possible so that normal visual acuity and binocular function could develop.

Duration of pilocarpine treatment varied between one month and 27 months (with a mean of seven months) in the large angle group. In the small angle group it varied from one to 72 months with a mean of 8 1/4 months. The two cases using pilocarpine for 72 months did so because the deviation could be controlled with the miotic and they had declined surgery.

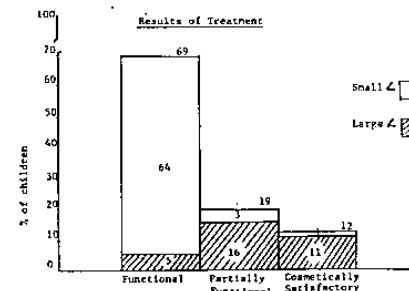


FIGURE V
Results of Treatment

RESULTS

Of these 263 cases (Figure V) 69% have a fully functional outcome while 12% achieved only a cosmetic improvement. Even those cases with a partially functional result have some useful "hold" and should be able to avoid a tendency to consecutive deviation in later life.

TABLE 1
Types of treatment and results
Comparison of Large Esodeviation (n=84) and Small Esodeviation (n=179)

Number Cases		Treatment								
		D only	D&O	D&G	D&S	D&O &G	D&O &S	D&G &S	D&O &G&S	
N cases	Large	0	67	47	75	42	61	41	36	
N cases	Small	130	34	17	8	7	3	1	0	
Treatment Results: Cases achieving										
Functional.	Large	0	9	5	8	5	7	2	2	
	Small	126	29	14	5	5	1	0	0	
Partially functional.	Large	0	32	25	40	23	31	24	22	
	Small	4	3	2	2	1	2	0	0	
Cosmetically satisfactory.	Large	0	26	17	27	14	23	15	12	
	Small	0	2	1	1	1	0	1	0	

(D = drops O = occlusion G = glasses S = surgery)

Table I gives an analysis of the treatment schedules used in both groups, correlated with the results achieved. There is a high proportion of fully functional results in the small and/or intermittent group particularly in those cases where miotics was the only method of treatment required. Where occlusion also had to be employed results were still reasonably good, but where the whole repertoire of treatment methods (the DOGS) were necessary fully binocular results were few.

Very few cases of large angle esotropia attained a fully functional result even with early referral and treatment. The outcome in these cases has been discussed elsewhere.¹⁰

DISCUSSION

The use of pilocarpine for very young children with esodeviation was advocated by Whitwell in 1962.¹¹ It had been used by Knapp and Capobianco in 1956¹² and Mayou in 1959¹³ but it has only recently been available in a vehicle which renders its effectivity sustained and prolonged. Pilocarpine in polyvinyl alcohol and in methylcellulose appears to control an early, small angle or intermittent esotropia for up to six hours. Side effects are few and parents readily co-operate with the treatment when they can see an immediate improvement in the child's condition.

Refractive error was not a significant factor in this group of infant esotropia which suggests that convergence control was not effectively linked with these young children's accommodative ability (AC/A factor). Miotic treatment at an early stage may have given the system enough support

so that the eyes could begin to respond binocularly and synchronously.

Baker and Parks¹⁴ believe that accommodative esotropia exists in infants under 12 months of age and that small angle congenital esotropia can deteriorate to a large angle deviation during the first year of life. Results in our studies support these views.

In those cases where there is significant refractive error miotics will also be useful. The pinhole effect can produce the desirable, clear, foveal image.^{15 16 and 17}

Large angle esodeviation does not appear to respond to pilocarpine so other methods of treatment should be employed. Pilocarpine is more effective in small or intermittent esodeviation where some binocular function is present. It does not work well in the presence of amblyopia which should be overcome as soon as possible.^{5 and 18}

It is interesting to note the high incidence of birth complications especially in the small/intermittent group which ultimately proved to have the best results. This suggests that cortical binocular mechanisms were intact and could begin to function normally as soon as peripheral influences became stabilised with adequate treatment.

CONCLUSION

Good results in early onset esodeviation can be achieved in many cases.

Infants should be referred for investigation and treatment as soon as a deviation is suspected. Treatment with mild miotic drops such as pilocarpine in the newer bases have few if any side

effects and have been shown to be reasonably effective and acceptable to infants and their parents.

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