

Past and Present of Amblyopia Treatment

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Amblyopia, 'Ambly's' 'ops' dull eye or lazy eye is known and treated for over 250 years. Clinically amblyopia is defined as decrease in best corrected visual acuity of two or more lines on standard chart in absence of any obvious pathology. It is prevalent in 2 to 4% of general population. Amblyopia, a preventable and curable decrease of visual function, is due to ocular deprivation arresting cortical development in absence of proper stimulation to fovea. Revell in 1971 attributed the definition of amblyopia as 'the condition in which the observer sees nothing and the patient very little, which implies that one must look beyond to retina to visual cortex for the cause of loss of acuity'.

According to Asper, *et al.* (2000), Amblyopia develops in early childhood in response to strabismus, anisometropia, high isoametropia or image degradation and it is syndrome comprising of a gamut of abnormality including deficiency in contrast sensitivity, luminance detection, fixation pattern, ocular motility, accommodation, crowding phenomenon, motion perception, stereo-depth perception and temporal processing in addition to acuity loss.

Pathophysiology

Amblyopia may be due to organic, functional, psychogenic or structural/pathogenic causes. Causes of organic amblyopia according to Schapero are nutritional, toxic and congenital. The psychogenic could be conversion hysteria and malingering. The structural/pathogenic causes may be due to achromatopsia and nystagmus. Functional amblyopia are form or stimulus deprivation, childhood constant unilateral strabismus, uncorrected amblyogenic refractive error (isoametropia more than +5.00 or -8.00, astigmatism of over 2.50 and anisometropia of more than +1.50 or -3.00). Chavasse referred the causes of amblyopia as being due to either extinction or arrest of the development of visual function (AOA 1999).

Critical period in present scenario: The development of the functional visual cortex occurs in stages. The maturation phase is called the 'critical period' imbalance or disruption during this phase can profoundly alter the selectivity of neurons to visual input. Different aspects of visual processing have slightly different critical periods, though they may overlap. It was long thought that treatment for amblyopia was only possible during this early critical period of visual development. However, newer observations have challenged the concept of a complete loss of plasticity in the visual processing areas even in adulthood, though the quality of plasticity in adulthood may differ from that in childhood. Our own research (AAO Spring 2000 Washington University) and other reports indicate that suppression can be reversed and vision successfully improved even after the end of the conventional critical period, though early intervention delivers better outcomes.

Examining a case of childhood amblyopia

Amblyopia is a childhood disease so the visual acuity assessment includes fixation preference and occlusion to determine if a difference in vision exists between two eyes. In preverbal children the quantitative test include Visual Evoked Potentials, Preferential looking, Teller Acuity Cards, Dot Visual Acuity and Catford Drum. Qualitative assessment is done by Fixation Following, Binocular Fixation Preference and Induced Tropia Test. In verbal children the acuity test is done by Allen Pictures, LEA Symbols, Tumbling Es, HOTV, Sheridan-Gardiner, Line numbers and Line Letters. Crowding Phenomenon, Neutral density Filter and foveal fixation assessment are additional tests.

Trends in treatment

De Buffon (L.G.1743) was pioneer in amblyopia therapy. He considered poor vision due to strabismus and recommended occlusion of fixing eye together with use of spectacles for poor eye. But in cases with eccentric fixation this occlusion of fixing eye was not successful. In 1953 Bangerter introduced occlusion of poor eye with eccentric fixation before active treatment with Haidinger Brushes or after image, though there has been a dispute about the use of inverse occlusion some advocate conventional occlusion till age of 5 years while other use after the age of 2 years. In addition to occlusion Comberg in 1936 introduced instrument to stimulate the macula, but it was not well accepted. In 1940 Bangerter introduced pleoptophore for direct stimulation of fovea. Cupper developed Euthyscope to dazzle the periphery and stimulate fovea with after image and Haidinger's brushes.

Though occlusion has been an established therapy for amblyopia but due to its own limitations including compliance there have been some modification like part time, partial, alternate and maintenance occlusion. Penalization (optical and pharmacological) is used as alternative of patching Red filter is used on eccentric fixation eye to stimulate fovea with occlusion of better eye. Though Elder disagrees stating that threshold sensitivity of rods and cones about the wavelength of red light being equal, but in our study we found it effective in treatment of eccentric fixation amblyopia (AAO Spring 2000 Washington). Cambell and team in 1978 proposed a new treatment based on intensive stimulation to amblyopic eye by CAM stimulator.

In spite of a long progressive journey of amblyopia treatment occlusion is most used for of treatment either as full or part time or penalization. Some centres provide aggressive treatment by stimulating fovea by pleoptophor, euthyscope and CAM stimulator.

Recommendations

Screening and age of first eye check up: Amblyopia should be detected in infants or young children. Amblyopia is most responsive to therapy if done before the age of 4 years and becomes unresponsive or poor responsive to most form of therapy after the age of 9 years.

Occlusion-part time vs full time: Occlusion has been used successfully for 250 years. In young children below age of one year only optical correction may help, in one year old child it should be 3 - 4 hours per day for 4 weeks, in two years old child 6 hour per day for 4 weeks, and in three years old child 8 hours per day for 4 weeks or alternatively you can advise alternate occlusion in less than one year 3 days to better eye to one day in amblyopic eye and in 1 - 2 years child the ratio can be 4:1.

Discontinue/Tapering of occlusion: When the visual acuity is same on two conjunctive visits, the patching should be gradually tapered.

Stability of vision: Scott and Dickey concluded that the better vision is at conclusion of amblyopia treatment the more stable will be vision over the time.

In strabismus cases the decision about the surgery should be taken after the use of spectacles and final outcome of amblyopia treatment.

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