

INTERMITTENT EXOTROPIA IN AVIATOR STUDENT

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ABSTRACT

Objectives: To report an aviator student suffering from intermittent exotropia after 4 years of flying in which he was previously orthoforia, good binocular vision and no complaint. **Methods:** A case report. A 25-years-old aviator student with intermittent exotropia classified as Divergence Excess caused by heterotropia, diplopia, decreased accommodation and no capacity convergent following his usual flight of over 16,000 feet. Bilateral recession 7.5 mm and orthoptics training for 2 months improved binocular vision. **Results:** Late Intermittent Exotropia can be caused by continuous flight over 16,000 feet for 4 years. Bilateral recession of lateral rectus muscle and orthoptics training can improve binocular vision and orthophoria. **Conclusions:** An aviator student needs good binocular vision. This patient suffered from intermittent exotropia following his flight of over 16,000 feet for 4 years. Bilateral recession of lateral rectus muscle and orthoptics training can improve binocular vision and orthophoria.

Keywords: aviator, flight, late intermittent exotropia, divergence excess, bilateral recession, orthoptics training

INTRODUCTION

The changes in air pressure, temperature, solar radiation, speed, maneuver movements as well as psychological aspects affect human during air flight. Eyes, as part of human body, are also affected by the high speed and altitude which require them to adapt by such condition to prevent any problems or accidents (Subagyo HS, 1981; Direktorat Kesehatan TNI-AU, 1995). Exodeviation or divergent strabismus is the outer deviation of the eyeball position which can be manifested either comitant or incomitant. According to Duane classification, the primary exodeviation comitant are exoforia, exotropia, intermittent and constant exotropia. The intermittent exotropia is the commonest case (Dale RT, 1982; Asbury T and Fredrik DR, 1999; Wilson ME et al, 2001-2002).

The common clinical manifestation of intermittent exotropia is a reflex closure of one eye when exposure to bright lights (Dale RT, 1982; Wilson ME et al, 2001-2002; Crone RA, 1973; Santiago AP et al, 1999; Diaz JP, 2000). Intermittent exotropia manifests in younger age or teenage which make early detection difficult (Dale RT, 1982). Thus, patient usually comes late to the ophthalmologist (Wilson ME et al, 2001-2002; Crone, RA, 1973). This case reported intermittent exotropia with decreased binocular vision in an aviator student, with history he had normal binocular vision and no complaint before.

CASE REPORT

A 25-years-old male, with aviator education background in "Pendidikan Latihan Penerbang (PLP)" Curug from 1996 - 1999, came to Outpatient Clinic Ophthalmology Department Dr. Soetomo Hospital in July 2002. He complained blurred and double vision while feeling fatigue. His problem started 1.5 years ago with initial frequency of once a week and getting worst to once a day since 1.5 months ago. He complained of headache and feeling a pressure on eyebrow area and tried to close his eye when exposed to the sunlight to have a clear vision. Before flight, he usually gives a pressure to his eyebrow area for ± 2 minutes in expense of his symptom free for ± 1 hour during flight. In addition, no family history of exotropia was found.

Eye examination:

Visual Acuity right eye visus 6/6, left eye visus 6/6, intraocular pressure of both eyes 17.3 mmHg (normal). Anterior segment examination : no abnormality, extraocular muscle movement : no abnormality (no paresis).

Qualitative examination : Hirschberg test orthophoria

Examination : Prisma cover test : near 30 Δ (exoforia), far 45 Δ (exotropia), Near Point Convergent (NPC) is good

Synoptophore (far) : objective 35 Δ XT, subjective difficult, no fusion

Worth Four Dot Test : near, no suppression and diplopia
Near distance stereoscopic with Titmus Test : 200 arc seconds (subnormal binocular vision, normal ≤ 60 arc seconds).

This patient underwent 7.5 mm bilateral lateral rectus muscle recessions.

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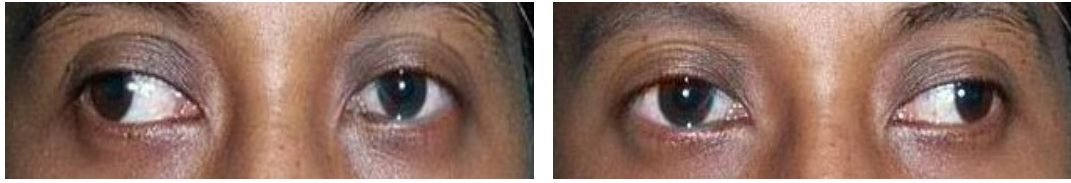


Figure 1 and 2. Before Surgery, Alternate Exotropia (After occlusion test)

RESULTS

Following bilateral lateral rectus muscles recession of 7.5 mm and orthoptic training for ± 2 months, his binocular vision much improved from 200 arc seconds to 60 arc seconds. He expressed his happiness for his symptoms free of headache and feeling pressure on

eyebrow area which then make him decided to stop training. However, such orthoptic training is required for aviator to improve their binocular vision < 60 arc seconds.



Figure 3. After Surgery, Orthophoria (no deviation)

DISCUSSION

Hypoxia, decompression, glare, myopia in empty space contribute to vision disturbance in human at high altitude. Hypoxia occurs in aviator during flight and can cause any changes to the vision ability (Direktorat Kesehatan TNI-AU, 1995). Indifferent zone is a zone between surface sea level to 10,000 feet. No influence for daylight vision was found in this zone whereas the scotopic vision is little affected. Adaptation zone is an area between 10,000 - 16,000 feet in which even though a little vision disturbance remain occurred but aviator usually can handle this problem relatively easy. The changes in this zone include: arterial blood pressure which correspond to the increased systemic blood pressure, increased intraocular pressure which also correspond to the increased of arterial blood pressure, pupil vasoconstriction, decreased scotopic vision of 40% (at 16,000 feet), decreased eye accommodation and convergence, and caused heterophoria.

The addition of oxygen or going back to the ground will normalize all the above changes. Up to 16,000 feet, those changes remain latent and thus aviator can compensate only at this altitude (Direktorat Kesehatan TNI-AU, 1995). Inadequate zone is an area between

16,000 to 20,000 feet where those changes are more difficult to handle and resulted in a vision problem for the aviator during flight. Decreased time to respond, decreased responsiveness of motoric reaction to visual sensory, decreased mental processes, heterophoria cannot be resolved by fusion which resulted in heterotropia which subsequently develop to diplopia, decreased eye accommodation and no convergence ability resulted in a blurred or double vision of the panel instrument (Direktorat Kesehatan TNI-AU, 1995). Decomensation zone or lethal altitude zone is an area above 25,000 feet. In this area, aviator could have circulatory failure, blindness, faint and permanent retinal or cerebral damage following neuronal death of severe hypoxia and inadequate blood circulation (Direktorat Kesehatan TNI-AU, 1995).

This patient has been flying for about ± 4 years and thus he developed heterotropia which subsequently manifested to diplopia, decreased eye accommodation and convergence ability. Those factors resulted in intermittent exotropia. Intermittent exotropia is a periodic deviation of the outer eyeball position or lateral (divergence) which usually become normal especially while patient looking at far distance object (Dale RT, 1982; Crone RA, 1973; Diaz JP, 2000; Hamidah MA,

1991). Exodeviation is a relatively common during daylight in which 35% - 40% of the cases occurred before 2 years of age (Santiago AP et al, 1999).

The commonest type of exotropia or primary divergence strabismus is intermittent type (Wilson ME et al, 2001-2002; Huggonier R and Clayette SH, 1969). Intermittent exotropia is relatively common than intermittent esotropia (Wilson ME et al, 2001-2002). The etiology of intermittent exotropia remains obscured or controversial and speculative. However, some factors which could be considered include mechanical or anatomical abnormality, nerves innervations which have similar role in primary specific comitant strabismus and genetic factor (Dale RT, 1982; Wilson ME, et al 2001-2002; Crone, RA, 1973; Santiago AP et al, 1999; Huggonier R and Clayette SH, 1969).

According to Duane Classification, intermittent exotropia is classified as (Dale RT, 1982; Asbury T and Fredrik DR, 1999; Wilson ME et al, 2001-2002; Santiago AP et al, 1999; Diaz JP, 2000; Scott WE et al, 1983).

1. Basic exodeviation
2. Insufficiency convergence
3. Divergence excess
4. Pseudo-divergence excess

This classification guides the decision of surgical techniques. The management of intermittent exotropia includes surgery and non-surgery. The objective of this management is to restore or maintain good development of visual acuity, binocular vision and cosmetic (Dale RT, 1982; Wilson ME et al, 2001-2002; Santiago AP et al, 1999; Gunawan W, 1991).

The decision to surgery includes (Wilson ME. et al, 2001-2002; Santiago AP et al, 1999; Gunawan W, 1991).

1. Inadequate control of exotropia in the office or home
2. Suffering of intermittent exotropia for at least 50% of life
3. Worsening intermittent exotropia control before surgical correction; serial observation is needed.
4. Progressive decrease of stereoacuity
5. Progressive decrease of stereopsis within months
6. Deviation of 20 Δ or more
7. Increasing frequency and amplitude of fusion/worsening fusion control or 50% deviation of life
8. The symptom of exotropia becomes constant and unsuccessful non surgical management
9. Insufficiency convergent patient with near distance sight deviation more than 20 prism diopter.

10. Confounding visual and diplopia. Severe asthenopia: asthenopia due to decreased intermittent exotropia control.

Surgical management is not recommended during foria phase, tropia phase of less than 50% of life and deviation of less than 20 prism diopter. This condition is well-managed using prism or occlusion. This patient's condition was classified as divergent excess because his deviation for far distance sight was higher than near distance sight which the minimum different is 10 prism diopter. The decision using surgical management for this patient was based on the frequency of intermittent exotropia of more than 50% of his life, high deviation of more than 20 prism diopter, increasing frequency and amplitude of fusion, confounding visual and diplopia, severe asthenopia, and decreased binocular/stereoacuity vision which interfere his job as aviator.

CONCLUSIONS

This case reported an intermittent exotropia which classified as divergence excess due to heterophoria which cannot be managed using fusion (heterotropia), diplopia, decreased eye accommodation and no capacity of convergence in an aviator student that has been flying for ± 4 years at the altitude of over than 16,000 feet. Bilateral lateral rectus muscles recession of 7.5 mm and orthoptic training for ± 2 months have been done to this patient to improve his previous binocular vision of 200 arc seconds to 60 arc seconds.

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