

The Correlation Between Eye Laterality and Hand Laterality in Unilateral Acquired Anophthalmia Due to Ocular Trauma

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Abstract- Introduction: Ocular trauma is one of the most under-recognized causes of vision loss especially in developing country. Many cases of vision loss due to ocular trauma result anophthalmia. There is complex relationship between visual system and manual motor system, called Eye-hand coordination (EHC). Surgical removal of the eyeball due to ocular trauma is always related to acquired anophthalmia.

Objective: To evaluate the correlation between eye laterality and hand laterality in acquired anophthalmia due to ocular trauma.

This is an analytic study with a cross-sectional approach among 30 patients who have been diagnosed by acquired anophthalmia due to ocular trauma that came to Aceh Tamiang General Hospital, Indonesia from February to June 2020.

Results: From this study, almost all subjects are males 28 patients (93,33%). The most common age group is 21-40 (36,67%). For the eye laterality, right eye is the most common eye of unilateral acquired anophthalmia occurrence due to ocular trauma, 24 patients (80,0%) than the other side. The right-handed patients were dominantly affected ocular trauma (93,33%). All the unilateral acquired anophthalmia cases in this study are due to open globe injury (100%). There is no correlation between eye laterality and hand laterality in unilateral acquired anophthalmia due to ocular trauma (CC=0,132)

Conclusion: There is no correlation between eye laterality and hand laterality in unilateral acquired anophthalmia due to ocular trauma. Dominant hand does not rule out the possibility of ocular trauma at the other side.

Index Terms- Eye laterality, hand laterality, unilateral acquired anophthalmia, ocular trauma

I. INTRODUCTION

Ocular trauma is a leading cause of unilateral blindness and be a particular concern to public health problem due to preventable.(1,2) Only 0,27% of the body surface area is presented the eye, and ocular trauma denote 7% of all body injuries. Eye-hand coordination (EHC) is the complicate relationship between the vision and manual motor system at the crossing between vision and dexterity. EHC is depends on the visual system that directs the hand movement towards an object. By optimal EHC, the movements carried out will be better directed and prevent

undesirable things such ocular trauma. (3,4) The most common serious complication of ocular injury is blindness. The aetiology of ocular trauma differ in urban areas compared to other settings, and differ from country to country, between different regions of the world, and between differing demographic or socioeconomic classes and variations of ocular trauma clinical characteristics must be well evaluated to prevent blindness (5,6). Many cases of ocular trauma are ending with anophthalmia. Anophthalmia is the absence of ocular tissue within the orbit and can affect one or both eyes. Surgical removal of the eyeball due to ocular trauma is always related to acquired anophthalmia. (7,8) Indonesia is a developing country with a large population, and the incidence of blindness due to ocular trauma is still high. This study is motivated by the current lack of data on ocular trauma in Indonesia, especially those resulting in anophthalmia.

II. MATERIAL AND METHODS

This study used an analytic study with a cross-sectional approach. We used total sampling as the sampling technique. All cases of ocular trauma were analyse at Aceh Tamiang General Hospital from February to June 2020. The inclusion criteria were all outpatient and inpatient diagnosed with unilateral acquired anophthalmia after evisceration due to ocular trauma with total sample 30 patients. The exclusion criteria were all patients with the history of ocular and orbital malignancies, and acquired anophthalmia due to other than ocular trauma. This study is to evaluate the eye laterality, age at the time of trauma, sex, hand laterality, type of ocular trauma and the occurrence of acquired anophthalmia due to ocular trauma.

This research has received permission from Health Research Ethical Committee of the Faculty of Medicine, Universitas Sumatera Utara, and also Aceh Tamiang General Hospital has also given permission to conduct research at the hospital. We classified the age (year) into 4 groups: 1-20, 21-40, 41-60, 61-80

Classification of eye trauma adapted from Birmingham eye trauma terminology system (present classification) which classified into two main groups: closed globe injury and open globe injury. In the close globe type, there was no full thickness wound in the eyewall, whereas in the open globe type there was a full thickness wound in the eyewall (cornea and sclera coat)

Statistical analysis

SPSS version 17.0 was used as the application to analyse the data in this study. This study used Pearson Chi-square to conclude whether there is a significant correlation between variables, then in order to evaluate the strength of the correlation between the eye laterality and hand laterality in the occurrence of acquired anophthalmia due to ocular trauma, the authors used the contingency coefficient.

III. RESULTS

A total number of 30 patients meet the criteria in this study. All the subjects are diagnosed as unilateral acquired anophthalmia due to ocular trauma. The eye laterality and hand laterality were evaluated when patients came to the hospital

Tabel 1. Characteristics of subjects with unilateral acquired anophthalmia

| Characteristic | n (%) |
|-----------------|------------|
| Sex | |
| Male | 28 (93,33) |
| Female | 2 (6,67) |
| Age (years) | |
| 1-20 | 6 (20,00) |
| 21-40 | 11 (36,67) |
| 41-60 | 10 (33,33) |
| 61-80 | 3 (10,00) |
| Eye laterality | |
| Right eye | 24 (80,0) |
| Left eye | 6 (20,0) |
| Hand laterality | |
| Right hand | 28 (93,33) |
| Left hand | 2 (6,67) |
| Type of trauma | |
| Close globe | 0 (0,0) |
| Open globe | 30 (100) |

From table 1 based on sex, almost all subjects are males, as many as 28 patients (93,33%). The most common age group is 21-40, as many as 11 patients (36,67%), followed by the age 41-60 (33,33%). The youngest age in this study is 14 and the oldest is 72 years old. For the laterality, right eye is the most common side of the occurrence of unilateral acquired anophthalmia due to ocular

trauma, 24 patients (80,0%) than the other side. The right-handed patients were dominantly affected ocular trauma. All the unilateral acquired anophthalmia cases in this study are due to open globe injury (100%).

Tabel 2 contingency table between hand laterality and unilateral acquired anophthalmia

| | | Dominant Hand | | Total | |
|--------------------|-----------|------------------------|--------------|--------|--------|
| | | Left-Handed | Right-Handed | | |
| Lateralization Eye | Left eye | % within Dominant Hand | 0,0% | 21,4% | 20,0% |
| | Right eye | % within Dominant Hand | 100,0% | 78,6% | 80,0% |
| Total | | % within Dominant Hand | 100,0% | 100,0% | 100,0% |

Pearson Chi-square = 0,536 ; DF=1; Asymp. Sig. = 0,464
Contingency Coefficient = 0,132

IV. DISCUSSION

Ocular trauma is a scary thing and became a nightmare for the patients, especially when the surgical removal of the eyeball is the last effort that must be done. The anophthalmia provides many negative effects and live changes of the patients. Shame,

unsecured, fear of meeting people, loss of self-confidence, anxiety to depression, stress and emotional instability, fear of become jobless, withdrawing from social life, those are the things that are often experienced by the patients.(9-11) Many studies found that males are commonly got ocular trauma than females.(12-14) Like any other study, in this study we found that male is the most common gender experienced anophthalmia due to ocular trauma

than females. We found that males were about fourteen times more likely to experienced ocular trauma. It probably happened because in Indonesia, most males who work for a living, while females tend to work at home as a housewife. The various published studies on ocular trauma found that young people are particularly vulnerable and have the highest incidence of ocular trauma. (15-17) In this study we also found that the majority group of age 21-40 experienced anophthalmia due to ocular trauma. From this study we found that at the age of 21-40 most males are works as a farmer and construction workers for living. Those kind of job need special skill and safety protective equipment. The ignorance, lack of skill, improper protective equipment are common factors causing ocular trauma, even causes anophthalmia in this study. The right eye is the most common eye experienced with ocular trauma in this study (75%). Many previous studies also said that ocular trauma usually occurs in the right eye.(12).

Eye-hand coordination (EHC), also known as hand-eye coordination is the synchronized control of eye movement with hand movement and the processing of visual input to lead reaching, grasping and doing something along with the use of proprioception of the hands to guide the eyes. Optimal EHC depends on appropriate ocular motor control for high perception of visual acuity and sound manual motor control produce solid effector coaction.(18-20)

The definite mechanism of how the eye laterality and hand laterality may affect the ocular trauma is still unknown. In this study, we also found that statistically, it is not necessarily true that the right-handed patient will develop ocular trauma in the right eye as there is no correlation between right-handed and the occurrence of ocular trauma in the right eye ($cc = 0,132$; $sig = 0,464$). Even though people with right-handed always hold the working instrument using their right hand and when eyes and hands are used to do the main activity, the eyes generally direct the movement of the hand to targets, so if an accident happens during working time, it tends to hit the closest side of the body (dominant side). However it does not rule out the possibility that the accident will injure the other side of the body (eye). Thus, nevertheless most Indonesian people is right-handed due the traditional behaviour that always use the right hand for activities, it does not rule out the possibility of left eye trauma .

In this study, the cause of acquired anophthalmia due to ocular trauma were open globe injury. Untreated or delayed treatment of open globe injury due to the distance to reach the hospital may worsen the prognosis so the surgical eye removal cannot be avoided. The limitation of the study most of the subject who come to the hospital was in the state of severe condition and the patient did not come immediately to seek the treatment, so surgical eye removal is the only alternative procedure.

V. CONCLUSION

Trauma is something that cannot be guaranteed but can be avoided and preventable. The information about the importance of safety protective equipment is needed to prevent ocular trauma especially for the people who live in rural area. Strategies of prevent ocular require proper knowledge of the cause or mechanism of ocular trauma. This study found no significant correlation between eye laterality and hand laterality in unilateral acquired anophthalmic patients due to ocular trauma. By perform

good regulation, eye laterality and hand laterality will not affect the occurrence of ocular trauma.

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