Retrospective Research of Central Retinal Artery Occlusion: Risk Factors and Onset-to-arrival Time

Zendy Sagita, Nadia Artha Dewi, Mirza Metita, Safaruddin Refa

Abstract: Central Retinal Artery Occlusion (CRAO) is an ophthalmologic emergency. Various systemic conditions can become risk factors. The purpose of this study is to discover the risk factors, and awareness of the emergency of patients with CRAO which is indicated by patient's onset-to-arrival time. The method used in this study is retrospective description from the medical record data of patients diagnosed with CRAO who comes to Saiful Anwar General Hospital for a period of 3 years. Sample collection is done consecutively, obtaining a total of 21 patients. The researched variables are age, visual acuity, risk factor, onset-to-arrival time, and acute-phase CRAO management success. Most of the CRAO patients found on this study are aged 60 years old, the highest amount of visual acuity upon arrival is 1/300, risk factor shows that 20 out of 21 samples have systemic hypertension, and almost all of the patients come for treatment 4-6 days after the onset. Most of the samples experience no change in their visual acuity after the therapy. The conclusion that hypertension is the highest risk factor of CRAO found on this study. The majority of patients come too late for treatment which causes not improving even worsening of their visual outcome.

Keywords : CRAO, Risk Factors, Onset-to-Arrival.

I. INTRODUCTION

Central Retinal Artery Occlusion (CRAO) is an ophthalmological emergency caused by obstruction of the Central Retinal Artery (CRA) due to thrombus or thromboembolus [1]. The incidence of CRAO is less than 2 per 100.000 people [2]. Patients with CRAO usually presents with acute symptoms, vision loss, and 80% of patients have the final visual acuity of counting fingers or even worse [1,3]. Prompt diagnosis and early treatment is needed so the irreversible damage of the retina and blindness can be avoided.

The risk factors of CRAO in various literatures, such as hypertension (HT), diabetes, heart valve disease, hyperlipidemia, giant cell arthritis, obesity, and

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cardiovascular disease [4].

Callizo et al in 2015 revealed that 67% of CRAO patients had a previous history of cardiovascular disease, 22% were coronary artery disease, 20% were arterial fibrillation and 17% were heart valve disease [5]. Seventy three percent of CRAO patients had the history of hypertension while 16% of them were newly findings after diagnosed CRAO [5]. Rudkin et al stated 64% of patients with CRAO had at least 1 newly diagnosed vascular risk factor after occlusive retinal events, with dyslipidemia being the most common risk factor that was not diagnosed before CRAO event (36%) [6]. Therefore, controlling risk factors in vulnerable population is very beneficial [1,7].

In this study, a retrospective study will be conducted to determine the risk factors that exist in patients with CRAO and the time of admission after an attack phase that suggest the increases of patient's awareness about CRAO emergencies.

II. MATERIAL AND METHODS

The method used in this study is retrospective descriptive. The variables chosen included age, visual acuity, risk factors, onset of arrival, and success of management in patients with CRAO. The data needed were taken from the patient's medical record in the Vitreo-Retina clinic at Dr. Saiful Anwar Malang Hospital (RSSA) for 3 years since February 2015 to February 2018. All samples that received CRAO management were included in this study. Twenty one samples were taken using the consecutive method. This study has obtained the ethical feasibility of RSSA Malang.

III. RESULTS

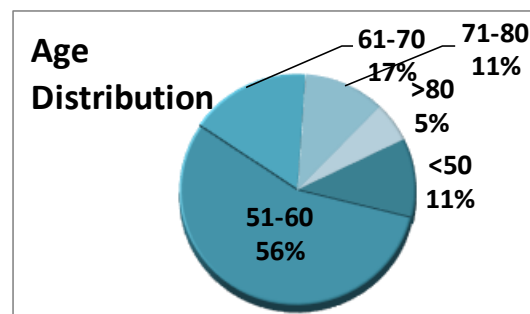In this study 21 samples were obtained.

Fig. 1. Age distribution of study subjects.

The largest distribution is in aged 51 to 60 years old. The classification of age ranges in this study was divided into 10-year ranges, namely under 50 years, 51-60, 61-70, 71-80 and above 80 years. From 21 samples, the following data were obtained, as many as 2 people under 50 years old, 10 people aged between 51-60 years, 3 people aged 61-70 years, 2 people aged 71-80 years, and only 1 person aged over 80 years.
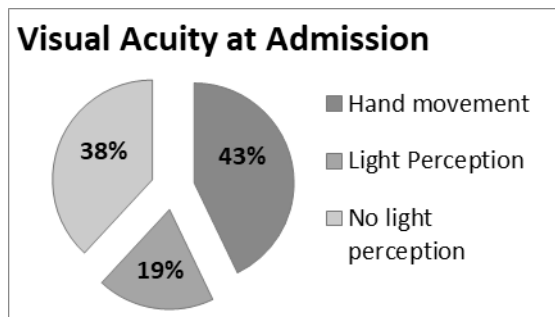

Fig. 2. Visual acuity of subject with CRAO at admission.

All of them have hand movement visual acuity and worse. The visual acuity of affected eye with CRAO assessed with Snellen chart found that 9 eyes (43%) had a vision of hand movement, 4 eyes (19%) light perception, and as many as 8 eyes (38%) were no light perception. For post-therapy visual acuity, there were only 9 (42%) of the 21 subjects who attended 1 day post-treatment follow-up. Of the 9 samples, only 1 patient had an increase in visual acuity, from hand movement to 2/60 at temporal side, 7 patients had unchanged vision acuity, and 1 patient had deterioration, ie hand movement become no light perception the next day.
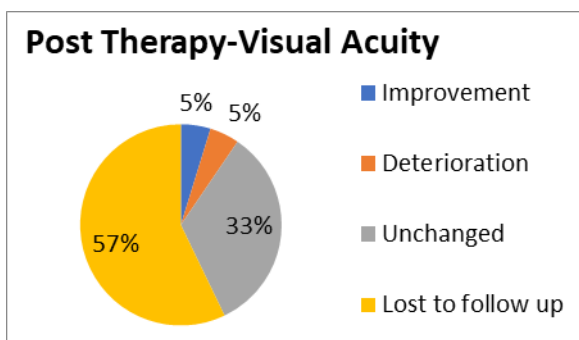

Fig. 3. Visual acuity of subjects with CRAO at 1 day post treatment.

Most patient did not come back to the hospital after treatment (57%). Based on the history, physical examination and laboratory examination of subjects, we investigate the risk factors that possibly cause CRAO. These factors included, the first, total 20 of 21 people had a history of hypertension which was mostly chronic and not routinely treated where the criteria for hypertension used according to WHO were pressure systole above 140 mmHg and diastole above 90 mmHg. Ten people have a history of hypercholesterolemia based on laboratory results, based on WHO, namely total cholesterol above 200 mg/dL and LDL above 160 mg/Dl [7]. Four people have a history of heart disease, which is divided into 1 right bundle branch block, 2

people heart failure, and 1 heart disease hypertension. 3 people have a history of CVA (cerebrovascular accident) or stroke. Three people with a history of diabetes and 6 people were active smokers.
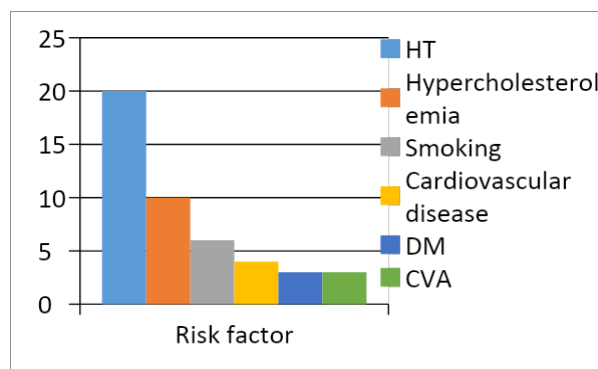

Fig. 4. Risk factors of CRAO.

The highest is systemic hypertension. Based on the history of study subjects, data were obtained regarding the onset or time of arrival of patients when they first felt a blurred-vision attack until they came to seek treatment at hospital. The time span is divided into less than 1 day or a matter of hours, 1-3 days, 4-6 days, 1 week - 1 month, and more than 1 month. The data obtained are as follows, 3 people came on less than 1 day onset, 7 people 1-3 days, 8 people 4-6 days, 2 people 1 week - 1 month, and 1 person came after more than 1 month after the attack.
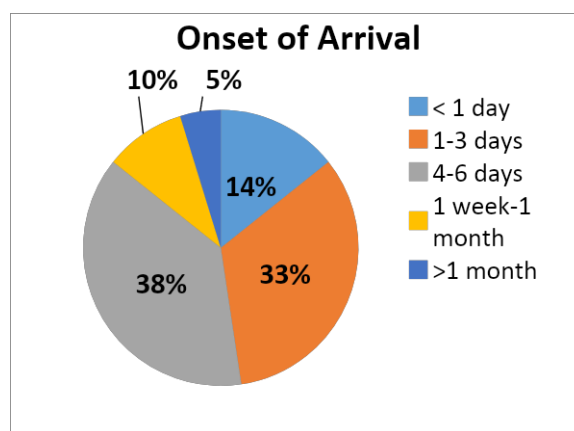

Figure 5. Onset of arrival.

Most subject came to hospital after 4-6 days of feeling sudden visual loss.

IV. DISCUSSION

Before discussing about the risk factors and the onset of arrival, there are some data obtained in this study such as age and visual acuity at the admission and after getting therapy. The first data regarding age, in this study the largest distribution was in the age range of 51-60 years (56%) and the second largest in the range 61-70 years (17%). This result is similar with study by Duker where it was mentioned the highest incidence of CRAO is in the range of 60 years. This may be related to other studies stated the prevalence of retinal

occlusion occurs in 1-2% of patients over 40 years of age [7,8]. Another CRAO risk factors in systemic conditions such as type 2 diabetes mellitus, dyslipidemia and arterial hypertension usually manifest in older patients.

The second data obtained is about the subject's visual acuity at admission. The visual acuity of eye affected by CRAO at admission assessed with Snellen chart found that 9 eyes (43%) had a visual acuity of hand movement, 4 eyes (19%) light perception, and as many as 8 eyes (38%) were no light perception. This is consistent with studies showed that 66% patients have a visual acuity of 20/400 or worse and only 18% have a visual acuity ≥ 20/40. Most cases with visual acuity ≥ 20/40 occur in the cilioretinal artery which can still maintain vascularization to the central macula. While the decrease in visual acuity to the level of absence of light perception is often associated with the occurrence of choroidal vascular insufficiency (partial or complete ophthalmic artery occlusion) [1].

There is a study stated that at 240 minutes the occurrence of CRAO, atrophy of the optic nerve and complete or almost total nerve fiber damage, results in massive and irreversible damage to the eye [1].This shows that there is a border line of time window for interventions that are closely related to the results and degree of healing. Time tolerance of irreversible damage occurs on the retina is still unknown, but may not exceed 4 hours, while none of the subjects who came to RSSA reached the time window of less than 4 hours (at least 9 hours). This is what makes it possible for all CRAO patients in RSSA to come with a visual acuity of hand movement or worse.

The next data is about what factors support the occurrence of CRAO cases in the eye, based on history, physical examination and laboratory examination of study search subjects sought for these factors. The first 20 of 21 people or almost all subjects had a history of hypertension, most of which were chronic and not routinely treated. Where the criteria for hypertension used according to WHO are pressure systole above 140 mmHg and diastole above 90 mmHg [10]. 1 out of 21 subjects did not obtain data on blood pressure. This shows that CRAO is almost always accompanied by a history of systemic hypertension (95%). This is in accordance with a study conducted by Callizo where it was mentioned that the risk factor for CRAO with the largest percentage was systemic hypertension although the percentage number was still below this study (73%) and 16% of them were new findings. So that from these data, all patients with CRAO should be blood pressure checked.

Another risk factor is hypercholesterolemia, in this study 10 people had a history of hypercholesterolemia (47%) based on lab results, based on WHO namely total cholesterol above 200 mg/dL and LDL above 160 mg/dL [10]. This data is in accordance with the results of Calizo's study where the data obtained were slightly higher (44%). This data shows that nearly half of all CRAO cases have a history of hypercholesterolemia, this is in accordance with the pathophysiology of CRAO, which is often caused by arterial sclerosis plaques associated with thrombosis that occurs in lamina cribrosa. In the previous study, 74% or the most

common cause of embolism was cholesterol, 10.5% was formed from calcific material, and 15.5% was formed from fibrin [5].

Then 4 (19%) people had a history of heart disease, which was divided into 1 right bundle branch block, 2 people heart failure, and 1 heart disease hypertension. The data has less value than the previous study in 2015 which showed 67% of CRAO patients to have a history of previous cardiovascular disease, of which 22% were coronary artery disease, 20% arterial fibrillation and 17% heart valve disease [4]. This is supported by a study from Sharma which states that every CRAO patient has an echocardiographic abnormality and is believed to have a 25x risk of cardioembolic events [11]. So according to the author, an echocardiographic examination for each CRAO patient is logical to do.

In this study 3 people (14%) had a history of CVA (cerebrovascular accident) or stroke, the figure was almost the same when compared with the study by Pielen that is 13%, and 6% occurred after the CRAO case [5]. This is supported by a study in Taiwan which stated that CRAO patients had a 2.7-fold chance of having a stroke compared to controls within a period of 3 years where the highest incidence was 1 month after experiencing CRAO. The study by Bruno mentioned a greater number, namely patients with CRAO had a stroke incidence of 10x more than the controls [9]. Hankey et al. Cited 30 of 98 patients who would experience myocardial infarction, and strokes after 6 years were exposed to CRAO. This is in line with previous studies which stated that patients with CRAO had a greater mortality rate of 4-5 times compared to life expectancies of the age-matched subjects based on population age and sex [12]. This possibility is due to the incidence of stroke having a pathogenesis similar to CRAO, namely atherosclerosis plaque.

Three people with a history of diabetes (14%) in CRAO patients had the same value as Callizo's study, this result was smaller compared to previous studies which stated that the prevalence of diabetes in CRAO was around 20-30%, this might be due to criteria more rigorous and comprehensive e way to diagnose diabetes in previous studies. The last factor was smoking, 6 people (28%) in the study were active smokers. This result is smaller than study by Calizo who got a score of 49%. But the data cannot be compared because of the different ways of obtaining data, where in this study the data was obtained based solely on medical record and history, whereas in Calizo's study the data was obtained based on filling in questionnaires by the subjects.

The last discussion is about the onset of arrival of CRAO patients. Based on data from the history of subjects, data regarding the onset or time of arrival when they first felt a blurred attack until the time they came for treatment were obtained. In this study, it was found that the majority of patients coming for treatment were 4-6 days (38%) followed by 1-3 days (33%). This is likely to cause patients to come with poor vision (hand movement or worse) as in the previous discussion.

Most patients who have passed the golden period for the acute phase of CRAO therapy, in an unwritten history why the patient arrives late, but see the age factor of the patient who most have passed the productive period so that it is not too disturbing daily activities, supported by many patients reside outside Malang (most from Malang district) which may be a factor of patients who are not independent to be able to come to self-medication to the hospital. This is very influential on the therapy given to patients and the visual prognosis of patients post-therapy where according to the literature the longer the occurrence of choroidal blood vessel insufficiency occurs, the greater the likelihood of nerve fiber damage and irreversible optic nerve atrophy.

Therefore, the suggestion that needs to be done to avoid this is to provide an understanding of the community to CRAO disease, prevention of what should be done, diligently controlling the risk factors that are owned, and if already experiencing symptoms such as CRAO, treatment must be done as soon as possible considering the CRAO time window is very narrow until permanent damage occurs.

At the writing of this paper it has the limitation that there is a lack of data regarding the patient's follow-up condition after CRAO therapy. This is caused by patients who did not come into control after being diagnosed as CRAO and given therapy. The possibility of patients not coming to control is due to the CRAO disease paradigm causing blindness that cannot be cured so patients feel its worthless to come back for treatment, this is in addition to the factors of patients being elderly and distant homes so that mobilization is disrupted.

V. CONCLUSION

The highest risk factor of CRAO found on this study is systemic hypertension. The majority of patients come too late for treatment which causes not improving even worsening of their visual outcome.

Patients need to be informed that there are still many things that can be done on CRAO in addition to restoring vision as preventing complications by looking for underlying risk factors so that patients get holistic therapy and vascular diseases in organs other the eyes can be avoided. Because the level of patient's awareness about emergency and irreversible conditions is still low, routine counseling to the wider community should be done.

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