

EFFECTIVENESS OF MEDICATION AND COMBINATION WITH SURGERY THERAPY IN REDUCING INTRAOCULAR PRESSURE ON GLAUCOMA OUTPATIENT AT LAVALETTE HOSPITAL MALANG IN JANUARY 2020 – DECEMBER 2021

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Abstract

Glaucoma is optic neuropathy group of chronically progressive disorders of the optic nerve that can lead to blindness on the advanced stage. Glaucoma risk factors is elevated intraocular pressure that could damage the optic nerve. Thus, maintaining the intraocular pressure is currently the only modifiable risk factor for the occurrence and progression of glaucoma. This research used retrospective analytical study using secondary data gathered from medical records as total sampling data. The sample was determined by purposive non-probability technique. Mean of intraocular pressure after therapies defined as dependent variable while the independent variable was the type of therapy. Combined therapy ($14,40 \pm 3,80$ mmHg) had the least post therapy intraocular pressure. Statistical test indicated there is a significant difference in effectiveness on medication, surgery, and combination therapy to glaucoma intraocular pressure reduction. The combined therapies between surgery and medication is more effective in lowering intraocular pressure compared to medication therapy to glaucoma.

Keywords: Glaucoma, Intraocular Pressure reduction, Therapy

Introduction

The term glaucoma refers to a group of progressive optic nerve diseases characterized by excavated shape of the optic disc, often described as cup-shaped, as well as loss of retinal ganglion cells and their axons and corresponding loss of vision. Glaucoma is a major public health problem and is the leading cause of irreversible blindness worldwide. It has been estimated that by 2020, approximately 80 million people worldwide will have glaucoma, with 11.2 million bilaterally blind as a result. Elevated intraocular pressure (IOP) is a continuous risk factor for the development of glaucoma over its entire range; however, it is not elevated in some patient and is not a defining characteristic of the disease. It has been shown that in most patients with glaucoma, lowering the IOP will stop or slow visual field loss. The intraocular pressure can be managed by medication therapy, surgery, or the combination between medication therapy and surgery. This research purposed to compare effectiveness between drugs and

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combined therapies in lowering glaucoma intraocular pressure. This also represent glaucoma treatments done at Lavalette Hospital Malang in 2020-2021.

Methods

This research used retrospective analytical study which secondary data was gathered from medical records between January 2020 – Desember 2021 at the outpatient glaucoma clinic of Lavalette Hospital Malang applying total sampling method. The sample was determined by purposive non probability technique. Intraocular pressure reduction after therapies defined as dependent variable while the independent variable was the type of therapy. The data were included based on criteria involving: 1) an outpatient with diagnose of any glaucoma and received any glaucoma therapy from Lavalette Hospital Malang between January 2020 – December 2021 2) minimum of follow up consultations are twice after the first consultation 3) post therapy intraocular pressure reduction can be evaluated and recorded in quantitative value (mmHg) while the data were excluded if based on criteria involving 1) an outpatient without diagnose of any glaucoma eventhough theyreceived any glaucoma therapy 2) an outpatient that was not received any glaucoma therapy eventhough the outpatient was diagnosed with any glaucoma 3) the follow up consultation is less than twice after the first consultation 4) post therapy intraocular pressure can not be evaluated or is not recorded in quantitative value. The data was clustered into descriptive tables and Mann Whitney test was performed to acknowledge the research objective.

Hasil dan Pembahasan

Total of 75 (150 eyes) subject with glaucoma were included in this research. Most of the subject were in the age of 51-70 (65.60%) while less subject were 11-30 (4.3%) with the mean age of $59,25 \pm 15,142$ years. Based on table 1, it can be seen that the most patients suffering from glaucoma at Lavalette Hospital Malang were men, as many as 44 people (58.66%) than females 31 people (41.33%) in this study. The sample distribution based on age and gender was presented in table 1. Only 93 of 148 eyes were diagnosed with glaucoma because some subjects did not have glaucoma on their both eyes. The most type glaucoma diagnosed was Primary Open-angle Glaucoma (48.39%) followed by Primary Angle-closure Glaucoma (40.86%), Juvenile Glaucoma (8.60%), and Neovascular Glaucoma (2.15%). The sample distribution based on type of glaucoma was presented in table 2.

The combination therapy between surgery and medication was the most frequent administered compared to medication therapy only, as shown in table 3. Trabeculectomy was the only surgery choice in this study. The least post therapy intraocular pressure was found in the combined therapy ($14,40 \pm 3,82$ mmHg) however the results of statistical tests using the Mann Whitney Test showed that there was a significant difference in medication compared with combined therapies efficacy to glaucoma intraocular pressure reduction with $p < 0.001$ (p value 0.05). Table 3 presents the data of intraocular pressure (IOP) reduction.

Table 1 Sample distribution based on age and gender

Variable	Frequency (f=75)	Percentage (%)
Age (years)		
11-30	4	4.30
31-50	9	9.67
51-70	61	65.60
71-90	19	20.43
Gender		
Female	31	41.33%
Male	44	58.66%

Table 2 Eye distribution based on type of glaucoma

Type of Glaucoma	Frequency (f=93)	Percentage (%)
Primary Open-angle Glaucoma	45	48.39
Primary Angle-closure Glaucoma	38	40.86
Juvenile Glaucoma	8	8.60
Neovascular Glaucoma	2	2.15

Table 3 Eye distribution based on glaucoma therapy

Type of Glaucoma	Frequency (f=93)	Percentage (%)
Combination	51	54.84
Medication	42	45.16

Table 4 Intraocular Pressure Reduction

Therapy	N	Mean IOP before (mmHg)	Mean IOP after (mmHg)	Mean IOP reduction	p value
Medication	42	23.11 ± 14.44	17.77 ± 10.22	5.34 ± 8.75	<0,001
Combination	51	34.96 ± 14.06	14.40 ± 3.82	20.56 ± 14.19	

Discussion

Combined therapy of drug and surgery had the least intraocular pressure after treatment ($14,40 \pm 3,82$ mmHg). Based on the Mann Whitney test, there was a significant difference in drugs, and combined therapy to glaucoma intraocular pressure reduction.

Age is a significant modifier of the relationship between IOP and glaucomatous loss in RNFL (retinal nerve fiber layer) thickness over time. Older patients may be more susceptible to glaucomatous progression than younger patients at the same level of IOP (Jammal et al., 2020). Aging likely contributes to the vulnerability of the optic nerve over

time, such that the aged optic nerve is less able to withstand various affronts, such as elevated eye pressure. In addition, the pathway by which eye fluid flows out of the eye also likely begins to weaken over time. As the outflow pathway weakens, the eye pressure gradually begins to increase. The risk of glaucoma is increased by 1% on people with age 51-70 years and 5% on people with age above 65 years while the risk of glaucoma is relatively small on people with age under 40 years (Pusvitasari & Triningrat, 2014). This study presents that the age of 51-70 (65.60%) was the most common age recorded with glaucoma. In Jammal studies, it demonstrated that despite a relatively lower glaucoma prevalence rate in the under 50 age group compared to other studies, this important cause of blindness calls for attention after the age of 55.

The prevalence of glaucoma may vary by sex, there was a reported 36% higher prevalence of glaucoma in males than females (Kapetanakis et al., 2016). Most previous studies agree that male sex is a risk factor for open-angle glaucoma, and female sex is a risk factor for angle-closure glaucoma (Giangiacomo & Coleman, 2009). However, there are studies that contradict this finding (McMonnies, 2017). Most of the subjects were males (58.66%). It is in (Ariesti & Herriadi, 2018) and (Pusvitasari & Triningrat, 2014), males were more dominant to females. These findings may only be relevant to the groups studied. That women usually live longer than men increases their risk for glaucoma and glaucoma blindness (Rudnicka et al., 2006). Difference in various studies about gender prevalence mainly affected by multiple factors, such as race, past medical history, oxidative stress, physical activity, or many other causes makes gender is not a major risk factor in glaucoma patient.

Primary Open-angle Glaucoma (48.39%), Primary Angle-closure Glaucoma (40.86%), Juvenile Glaucoma (8.60%), and Neovascular Glaucoma (2.15%) were the most common glaucoma type found among the subjects. There are two major types of glaucoma: primary and secondary glaucoma. Both of these have two major subtypes (open-angle and angle-closure) according to the underlying anatomy and pathophysiology. An estimated 57.5 million people worldwide are affected by POAG with a global prevalence of 2.2% (Allison et al., 2020). In Das and Shomaj study, Primary angle closure glaucoma (PACG) was the most common glaucoma subtype. The primary open angle glaucoma (POAG) to the PACG ratio was 37:63. This is aligned with Talaat study, shows that the most common type was primary open-angle glaucoma (POAG; 53%) followed by secondary glaucomas (SG; 26.5%) then childhood glaucoma and primary angleclosure glaucoma (CG, PACG; 7.4%). The majority of secondary glaucoma cases were due to neovascular glaucoma (NVG; 44.9%), this is correlate with this study findings that shows neovascular glaucoma is common in Lavalette Hospital Malang. Based on the results from studies above, there are several types of glaucoma; however, the two most common are primary open-angle glaucoma (POAG), characterized by a slow and insidious onset, and primary angle-closure glaucoma (PACG), which is less common and tends to be more acute.

The most widely accepted risk factors include higher IOP; lower ocular perfusion pressure; older age; lower central corneal thickness (thinner cornea); high myopia; and

racial, ethnic, and genetic susceptibility. Currently, topical ocular hypotensive medications, with its different classes, as well as filtering surgery (trabeculectomy and non-penetrating surgery) are in the forefront of therapeutic modalities to reduce IOP (Leske et al., 2003). Glaucoma treatment entails reducing IOP by improving aqueous outflow, decreasing aqueous humor production, or a combination of the two. Medical therapy for glaucoma has been available for over a century and there is moderate evidence that all of the currently used medications lower IOP. In this study, combination therapy (54.84%) was the most frequent therapy administered compared to medication therapy only. Eye drops, commonly nonspecific beta-blocker or prostaglandin analogue drops, generally are the first-line treatment to reduce intraocular pressure (Distelhorst & Hughes, 2003). In Boland study shows that among medications, the prostaglandin agents are consistently superior to the other classes in terms of their pressure lowering ability. Specifically, latanoprost has been shown to be superior to timolol, brimonidine, and dorzolamide. This also correlate with this study where as the most common eyedrops is Timolol (Beta Blocker) and Xalatan (Prostaglandin Analogues). Laser treatment and surgery usually are reserved for patients in whom medication therapy has failed. Without treatment, open-angle glaucoma can end in irreversible vision loss. In a study held by Martinez, medical treatment was the most common initial management given to glaucoma patients in general while surgical intervention as the initial treatment was more commonly done in secondary glaucoma (36.81%) and PACG (33.33%). According to a study by (Theilig et al., 2020) Primary open-angle glaucoma has been treated primarily with pharmacotherapy, although surgery is recommended if the intraocular pressure does not reach the target. On the other hand, primary angle-closure glaucoma was treated with a combination of laser iridotomy and drug therapy. For other glaucoma treated with surgical therapy, drug therapy was continued if the postoperative intraocular pressure remained above 22 mmHg. This is why all glaucoma patient who undergo surgery in this study still need to be combined with medication, to maintain IOP below 22 mmHg. The most frequently used intraocular surgery for glaucoma has been the trabeculectomy, which involves the creation of a partial-thickness scleral flap over a sclerectomy into the anterior chamber (Coleman, 2012). Trabeculectomy was the only type of surgery therapy done in this study. Based on the research results above, medication therapy is the first line treatment for glaucoma patients and is safer than surgical treatment, so it is the most commonly used treatment method. Combined therapy with surgery were administered to patient with uncontrolled intraocular pressure using medication therapy and to PACG patient. Although trabeculectomy has some complications that can damage the eye, it was still the gold standard method of glaucoma surgical treatment.

The mean of intraocular pressure reduction of medication and combination therapy wererespectively 5.34 ± 8.75 mmHg and 20.56 ± 14.19 mmHg. Combination therapy resulted the highest intraocular pressure reduction (20.56 ± 14.19 mmHg) this corresponds to the Mann Whitney test ($p \text{ value} \leq 0,05$) specified that there was a significant difference in effectiveness between medication and combination therapy with surgery. Successful control of IOP was defined as IOP less than 21 mmHg or a reduction

of 33% if preoperative pressure was less than 21 mmHg (Suzuki et al., 2002). According to (Lichter et al., 2001) in Collaborative Initial Glaucoma Treatment Study, medication and surgery therapy significantly lowered the intraocular pressure on initial treatment but the decrease of intraocular pressure treated using surgery therapy was higher than the medication therapy. In a study by Motlagh, the surgical approach had greater efficacy than conventional medical therapy in patients with open-angle glaucoma. Based on the evidence we analyzed, it is likely that trabeculectomy is superior to medications in terms of preventing visual field loss. And this study shows that combination therapies between medication and surgery is significantly more effective for glaucoma intraocular pressure reduction.

Conclusion

This study show the characteristic of glaucoma patient in Lavalette Hospital Malang and also compare the effectivity between two types of therapies. This study shows that age 51-70 dominated the subjects and there was no big difference in male and female. The highest prevalence type of glaucoma was primary open-angle glaucoma while most frequent therapy provided was combination therapy. Timolol and Xalatan were the most frequent drug administered in medication therapy. Trabeculectomy was the most frequent surgery done. Statistical test indicated that there was a significant difference between two types group of therapy. Combination therapies is more effective to reduce the intraocular pressure rather than medication only in glaucoma patient.

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