The Outcome of Trabeculectomy Surgery among Patients at University of Gondar Tertiary Eye Care and Training Center, Northwest Ethiopia

Dereje Hayilu Anbesse1, Fisseha Admasu Ayale2 and Kibrom Legesse Gebresellasie1
1Department of Optometry, School of Medicine, College of Medicine and Health Sciences, University of Gondar, Ethiopia
2Department of Ophthalmology, School of Medicine, College of Medicine and Health Sciences, University of Gondar, Ethiopia

Corresponding author: Dereje Hayilu Anbesse, Department of Ophthalmology, School of Medicine, College of Medicine and Health Sciences, University of Gondar, Ethiopia, Tel: +251910046930; E-mail: derejemk2004@gmail.com

Abstract

Objective: The aim of this study was to assess outcome of Trabeculectomy surgery in terms of preservation of intraocular pressure, visual acuity and optic nerve head defect among patient undergoing trabeculectomy surgery at university of Gondar tertiary eye care and training center.

Methods: Hospital based cross sectional study was conducted from January to February 2017. A total of 69 consecutive ‘modern’ augmented and non-augmented ‘safe-technique’ trabeculectomies performed over a 2-year period (2012-2014) were assessed. Patients’ data from the charts were extracted and analyzed by SPSS version 20. Descriptive statistics were done to summarize the data. Paired samples t-test was performed to compare the correspondent preoperative and postoperative IOP, VA and CDR. P-value<0.05% was considered as statistically significant.

Results: A total of 69 eyes of 63 patients having post-operative follow up of six months were included in the study. The mean age at the presentation was 59.12 ± 12.64 years. On the last day before surgery, mean snellen VA was 0.28 (± 0.23) and it was changed to 0.24 (± 0.20) p=0.38, mean IOP was 31.87 mmHg (± 10.08) and it was reduced to 18.45 mmHg (± 6.12) p=0.001, mean CDR was 0.84 mm (± 0.13) and it was changed to 0.85 mm (± 0.12), p = 0.009 at six months after surgery. Complete success and failure of trabeculectomy was 52 (75.4%) and 8 (11.6%), respectively.

Conclusion: Based on IOP, the success rate of trabeculectomy was 75.4%. The mean preoperative VA was dropped by one line at six month after surgery and there was significant reduction of IOP from its base line.

Keywords: Trabeculectomy; Gondar city; Ethiopia

Abbreviations VA: Visual Acuity; IOP: Intraocular Pressure; CDR: Cup to Disk Ratio

Introduction

Trabeculectomy is a surgical procedure featuring a partial-thickness scleral flap that creates a fistula between the anterior chamber and the sub-Conjunctival space for filtration of aqueous fluid and the creation of a bleb. It is indicated for the treatment of glaucoma when a maximum tolerated medical therapy is failed to achieve safe intraocular pressure (IOP) in terms of preservation of optic nerve head and visual field loss [1-3].

Even though trabeculectomy surgery is a gold standard, it has its own complications and possibility of failure in controlling IOP. However, in sub Saharan Africa due to expensive and inadequate hypotensive drugs and trained glaucoma specialists, trabeculectomy is still the most widely performed surgery in treating open angle and chronic angle closure glaucoma [4-6].

The recent advances in trabeculectomy surgery techniques includes sub-tenon anesthesia, careful choice of the surgical site, fashioning of the scleral flap to produce diffuse aqueous flow and better IOP control, a formed anterior chamber, with outflow control during surgery using an infusion, optimal method of antimetabolites application and using new adjustable sutures. These will reduce the complications like hypotony, infection and scarring which will limit the success of trabeculectomy [7].

From the meta analysis done in Africa regarding the outcome of trabeculectomy surgery, the rate of success varied from 61.8% to 90% in terms of IOP between 10-20 mmHg were reported. Trabeculectomy with or without application of anti-metabolite appears to be a good way of lowering the IOP in Africa [8].

The outcome and the success rate of this surgery were not yet known in Ethiopia; particularly in Gondar city where there is ophthalmology center that has been doing trabeculectomy surgery for more than 10 years duration. Therefore this study will aim to assess the outcome of trabeculectomy surgery in terms of preservation of IOP, Visual acuity (VA) and Optic nerve head defect among patient undergoing trabeculectomy surgery at university of Gondar tertiary eye care and training center, northwest Ethiopia.
Methods

Study design and setting

Hospital based cross sectional design study was conducted from January to February 2017 at University of Gondar tertiary eye care and training center. University of Gondar Tertiary eye care and training center is the only tertiary eye care center in northwest Ethiopia, which provides different specialty eye care service and training of ophthalmology, optometry and ophthalmic nurse. It has been serving more than 14 million populations.

Surgical procedures

All surgeries were done under topical proparacain drops followed by injection of 2 ml of lidocaine without adrenaline that was administered in the superior sub-tenon space at the beginning of dissection for conjunctival flap. After exposing the superior part of globe, fornix based conjunctival flaps were done with posterior dissection. Sterile sponge soaked in 5-fluouracil 5 mg was applied under the conjunctival flap with rotation of its position for 1 to 3 min depending on the thickness of conjunctiva and tenons. Similarly, mitomycin C (MMC) with concentration of 0.1 mg/ml was used only in 7 eyes as it was not always available. A 3 mm by 4 mm scleral flap was constructed with pre-placement of two 10-0 nylon sutures at the angles. After a temporal paracentesis, a 1 mm sclerostomy was done using Kelly’s punch that was followed by peripheral iridectomy. The scleral flap was closed with nylon 10-0 preplaced sutures with suture tension that allowed a slow and continuous trickling of fluid flow under the flap. Additional sutures were added in cases where the flow was robust. The conjunctival flap was closed by purse string sutures at the two ends of the wound and checked for water tightness. Bleb was formed by injecting saline into anterior chamber through paracentesis. At the end of each procedure, sub conjunctival and steroid was given for all injection of a combination of antibiotics patients.

Outcomes of the study

Trabeculectomy success was defied as IOP <21 mmHg and/or IOP <30% reduction below baseline without any additional medication or bleb needling. Qualified success was if with at least one medication and/or bleb needling, IOP <21 mmHg or IOP <30% reduction below baseline was achieved. Surgical failure was considered if all eyes that were not met the above criteria for success and qualified success.

Data collection procedures

However, 156 Trabeculectomy surgeries were performed over a 2-year period (2012-2014), only total of 69 eyes of 63 patients data were reviewed due to high percentage of lost follow at 6 months postoperatively. The data was collected from the patients’ record charts at a time by trained optometrists using the data extraction format. All patients’ record with Trabeculectomy surgery was included in the study. Those who had additional laser therapy and/or tube shunt were excluded from the study. The charts with insufficient data were also excluded. The collected data included: baseline demographic data, preoperative VA, IOP, cup to disc ratio (CDR), duration, types and stages of glaucoma, types of topical and systemic anti glaucomatous medications, intra operative use of anti-metabolites, and post-operative VA, IOP, CDR and the use of anti-glaucomatous medication.

The study was conducted in accordance with the Declaration of Helsinki and approved by the nine members of University of Gondar College of medicine and health science Ethical Review Board.

Statistical analysis

The secondary data from the charts were carefully coded and entered into EPI INFO 3.5.1 and exported to, processed and analyzed by Statistical Package for the Social Science (SPSS) version 20. Descriptive statistics such as frequency and cross tabulation were done to summarize the data. Paired samples t-test was performed to analyze and compare the correspondent preoperative and postoperative IOP, VA and CDR. P-value <0.05% was considered as statistically significant.

Results

A total of 69 eyes of 63 patients undergone Trabeculectomy surgery over two years (2012-2014) having postoperative follow up of six months were included in the study. The mean age of patients at the presentation was 59.12+12.64 (Range: 20-86) years. Two third 50 (72.5%) of the subject's sex were male and more than half of them 40 (58%) were living in urban area shown in Table 1.

Table 1: The socio-demographic characteristics of patients’ undergone trabeculectomy surgery at University of Gondar tertiary eye care and training center, northwest Ethiopia, 2017.

| Variable (n=63) | Frequency | Percentage |
|----------------|-----------|------------|
| Age category   |           |            |
| 20-50          | 15        | 23.8       |
| 51-70          | 40        | 63.5       |
| 71-86          | 8         | 12.7       |
| Sex            |           |            |
| Male           | 50        | 72.5       |
| Female         | 13        | 27.5       |
| Address        |           |            |
| Urban          | 37        | 58.7       |
| Rural          | 26        | 41.3       |

On the presentation day nearly half 33 (47.8%) of all eyes were presented with pseudo-exfoliative glaucoma followed by primary open angle glaucoma 30 (43.5%). Two third 46 (66.7%) of all eyes were on the advanced stages before surgery and all eyes were at least on one ocular hypotensive medication until the surgery day. The mean glaucomatous duration of all eyes before surgery was 5.11 months (SD 7.19) as shown in Table 2.

Table 2: The characteristics of glaucoma type among patients who underwent trabeculectomy surgery at University of Gondar tertiary eye care and training center, northwest Ethiopia, 2017.

| Variables         | Frequency | Percentage |
|-------------------|-----------|------------|
| Types of glaucoma |           |            |
| POAG              | 30        | 43.5       |
| PXG               | 33        | 47.8       |
| Others            | 6         | 8.7        |
Ethiopia, 2017. (POAG: primary open angle glaucoma, PXG: pseudo-exfoliative glaucoma) failure of Trabeculectomy among POAG was 22 (31.9%), 4 (44.4%) 4 (50.0%) respectively.

Table 2: Clinical status of eyes undergone trabeculectomy surgery at University of Gondar tertiary eye care and training center, northwest Ethiopia, 2017 (POAG: primary open angle glaucoma, PXG: pseudo-exfoliative glaucoma, Others include juvenile open angle glaucoma, Pigmetary glaucoma, and Chronic angle closure glaucoma).

Half of the eyes 35 (50.8%) were undergone Trabeculectomy without anti metabolite whereas in 27 (39.1%) and 7 (10.1%) eyes, 5-Fluorouracil (5FU) and Mitomycin C (MMC) was used respectively as shown in Figure 1.

Table 3: The outcome of Trabeculectomy in terms of types, preoperative duration and stages of glaucoma among eyes undergone the surgery at University of Gondar tertiary eye care and training center, northwest Ethiopia, 2017 (POAG: primary open angle glaucoma, PXG: pseudo-exfoliative glaucoma, Others include juvenile open angle glaucoma, Pigmetary glaucoma, and Chronic angle closure glaucoma).

Discussion

Different authors defined the success rate based on the different criterion for various post-operative follow up durations. For the eyes in this study, the complete success rate was 52 (75.4%) and qualified success was 9 (13%) at the six months after the surgery. In comparison with two different studies which utilize similar criteria with the present study, this amount of overall success rate in the present study is better [9,10]. However in comparison to three studies with success rates of 88%, 85% and 82%, the current result is lower [11-13]. The Trabeculectomy failure found in this study was 8 (11.6%). The reason for this amount of failure was not clear. But previous studies suggested that pseudophakia, development of an encapsulated bleb (Tenon’ cyst), the type and/or length of preoperative medication, higher preoperative intraocular pressures were identified as significant risk factors for the failure of Trabeculectomy [14,15].

In the present study, no significant difference in the outcome of Trabeculectomy between eyes with PXG (46.2%) and POAG (42.3%), p=0.34. Studies comparing the results of Trabeculectomy between patients with POAG and those with PXF are few in number. The previous study conducted in 1999, which found similar IOP-lowering effect in 30 eyes with PXG and 30 eyes with POAG during a follow-up period of 2 years reported the similar finding with present study [16]. However, the finding from studies published in 2002 and 2013 reported that complete success rates were significantly better in the POAG group than in the PXG group [12,17]. There were no a clear reasons why this discrepancy was happens. The incidence of PXG is occur in older ages and had significantly higher preoperative IOP than in POAG might be the reason for lower success rate of Trabeculectomy among PXG eyes. But this study didn't support this finding since in

| Stages of glaucoma | Moderate | Advanced |
|--------------------|----------|----------|
|                    | 23       | 46       |
|                    | 33.3     | 66.7     |

| Preoperative duration of glaucoma | Up to 5 months | >5 months |
|-----------------------------------|----------------|-----------|
|                                  | 47             | 22        |
|                                  | 68.1           | 31.9      |

| Types of medication | Timolol | Timolol and diamox | Timolol and pilocarpine | Timolol, diamox and pilocarpine |
|---------------------|---------|--------------------|-------------------------|---------------------------------|
|                     | 25      | 24                 | 11                      | 9                               |
|                     | 36.2    | 34.8               | 15.9                    | 13                              |

| Types of glaucoma | POAG | PXG | Others |
|-------------------|------|-----|--------|
|                   | 22 (42.3%) | 24 (46.2%) | 6 (11.5%) |
|                   | 4 (44.4%) | 5 (55.6%) | 0        |
|                   | 4 (50.0%) | 4 (50.0%) | 0        |

| Preoperative duration | Up to 5 months | >5 months |
|-----------------------|----------------|-----------|
|                       | 28 (68.3%)     | 13 (31.7%)|
|                       | 6 (100%)       | 0         |
|                       | 5 (71.4%)      | 2 (28.6%) |

| Stages of glaucoma | Moderate | Advanced |
|--------------------|----------|----------|
|                    | 19 (36.5%) | 33 (63.5%) |
|                    | 2 (22.2%)  | 7 (77.8%)  |
|                    | 2 (25%)    | 6 (75%)    |

Table 1: Clinical status of eyes undergone trabeculectomy surgery at University of Gondar tertiary eye care and training center, northwest Ethiopia, 2017. (POAG: primary open angle glaucoma, PXG: pseudo-exfoliative glaucoma, Others include juvenile open angle glaucoma, Pigmentary glaucoma, and Chronic angle closure glaucoma).

Table 2: Clinical status of eyes undergone trabeculectomy surgery at University of Gondar tertiary eye care and training center, northwest Ethiopia, 2017. (POAG: primary open angle glaucoma, PXG: pseudo-exfoliative glaucoma, Others include juvenile open angle glaucoma, Pigmentary glaucoma, and Chronic angle closure glaucoma).

| Variables                  | Complete success | Qualified success | Failure |
|----------------------------|------------------|-------------------|--------|
| Types of glaucoma          |                  |                   |        |
| POAG                       | 22 (42.3%)       | 4 (44.4%)         | 4 (50.0%) |
| PXG                        | 24 (46.2%)       | 5 (55.6%)         | 4 (50.0%) |
| Others                     | 6 (11.5%)        | 0                 | 0      |

| Preoperative duration      | Up to 5 months   | >5 months         |
|----------------------------|------------------|------------------|
|                            | 28 (68.3%)       | 13 (31.7%)       |
|                            | 6 (100%)         | 0                |
|                            | 5 (71.4%)        | 2 (28.6%)        |

| Stages of glaucoma         | Moderate         | Advanced         |
|----------------------------|------------------|------------------|
|                            | 19 (36.5%)       | 33 (63.5%)       |
|                            | 2 (22.2%)        | 7 (77.8%)        |
|                            | 2 (25%)          | 6 (75%)          |

| Trabeculectomy technique at University of Gondar tertiary eye care and training center, northwest Ethiopia, 2017. |

On the last day before surgery, the mean snellen visual acuity of all eyes had been 0.28 (±0.23). At the six months after surgery, it was changed to 0.24 (±0.20) p=0.38. Mean IOP on the last day before surgery was 31.87 mmHg (± 10.08) and it was reduced to 18.45 mmHg (± 10.0) p=0.009.

Based on the IOP reduction from preoperative baseline to <21 mmHg and/or 30% reduction, complete success rate of Trabeculectomy was 52 (75.4%). Qualified success was 9 (13%) and failure was 8 (11.6%). The complete success, qualified success and failure of Trabeculectomy among POAG was 22 (31.9%), 4 (44.4%) 4 (50.0%) respectively. The complete success, qualified success and failure of trabeculectomy in advanced stages of glaucoma was 33 (63.5%), 7 (77.8%) and 6 (75.0%) respectively (Table 3).
both groups there was no statistically significant difference of Trabeculectomy success rate.

Preoperatively, the mean IOP was 31.87 ± 10.08 mmHg and the mean postoperative IOP at six months after surgery was reduced to 18.45 ± 6.12 mmHg, p=0.001. This result is similar with different studies conducted by different authors at different time with different follow up period and population [18,19]. It is supported by the result reported by study conducted in Ghana which indicated that there was statistically significant difference between the mean pre-op and post-op IOP (p=0.001) at the last examination at six months [20].

The preoperative mean VA was 0.28 ± 0.23 and the mean VA postoperatively at six months was 0.24 ± 0.20, p=0.038. This indicated reduction of post-operative snellen VA by one line from preoperative mean VA. It is in agreement with other studies reports, which show that reduction of VA is a common event usually after long term Trabeculectomy. This might be due to the fact that the development or progression of cataract and/or worsening of visual field loss [11].

At the six after surgery, there were a difference in complete and qualified success rates of Trabeculectomy proportion among eyes augmented with 5FU (85.2%, 13%) and MMC (68.6%, 7.4%) and non-augmented trabeculectomies (71.4%, 14.3%) respectively, but the differences were not statistically significant, p=0.31. However, the study conducted among black West African population, reported that complete" (without medical therapy) postoperative success was greater in the MMC group with a significantly higher proportion achieving an IOP <21 mmHg (P=0.02) [6]. The discrepancy observed here might be due to that the present study is a short term while the previous is long term assessment of Trabeculectomy outcome. The baseline, preoperative and postoperative IOP and complications might be makes a difference here.

The mean CDR of all eyes on the last day before surgery was again 0.84 ± 0.13 and was changed to 0.85 ± 0.12 mm (p<0.01) at six months after surgery. There was a failure for the CDR>0.8 (10.9%). This finding is consistence with study done among East African population, which reported failure on the CDR result from 0.9 or worse and increasing by 0.027 units [21].

The limitation of the present study is that it used secondary data from patient record chart which were not had the information about visual field.

Conclusion

Based on IOP level the success rate of Trabeculectomy after six months of the surgery was 75.4%, which is satisfactory. The mean preoperative VA was dropped by one line and there was significant improvement of IOP at six months after surgery. To explore predictors for surgical failure and increase the efficacy, it is better to assess long term multicenter prospective follow up study regarding the outcome of Trabeculectomy.

Acknowledgements

We would like to thank university of Gondar tertiary eye care training center for their cooperation in providing the patients record data.

Conflict of Authors

All authors declare that there is no conflict of interest.

References

1. Robert NW, Richard PM. Glaucoma Surgery: Principles and Techniques (American Academy of Ophthalmology Monograph Series) 2nd ed. OUP/USA (14 Aug. 2003) ISBN-10: 1560550465; ISBN-13: 978-1560550464.
2. Cairns JE (1968) Trabeculectomy. Preliminary report of a new method. Am J Ophthalmol 66: 673-638.
3. Feiner L, Piltz-Seymour JR (2003) Collaborative Initial Glaucoma Treatment Study: a summary of results to date. Curr Opin Ophthalmol 14: 106-111.
4. Edmunds B, Thompson JR, Salmon JF, Wormald RP (2002) The National Survey of Trabeculectomy. III. Early and late complications. Eye 16: 297-303.
5. Kiage DO, Danjji KF (2008) primary open angle glaucoma; setting target intraocular pressure range and update on use of glaucoma medication in East Africa. East African J Ophthalmol 112:60-71.
6. Kim HY, Egbert PR, Singh Kuldev (2008) Long-term Comparison of Primary Trabeculectomy With 5-Fluorouracil Versus Mitomycin C in West Africa. J Glaucoma 17: 578-583.
7. Jones E, Clarke J, Khaw PT (2005) Recent advances in trabeculectomy technique. Curr Opin Ophthalmol 16: 107-113.
8. Soatiara J, Kpoghoumou M, Kalembo F, Huyl Zhen H (2013) Outcomes of Trabeculectomy in Africa. Open J Ophthalmol 3: 76-86.
9. Huang CY, Tsenga HY, Wu KY (2013) Mid-term outcome of trabeculectomy with adjunctive mitomycin C in glaucoma patients. Taiwan J Ophthalmol 5: 31-36.
10. Bhatia J (2008) Outcome of Trabeculectomy Surgery in Primary Open Angle Glaucoma. Oman Med J 23: 86-89.
11. Anand N, Mielke C, Dawda VK (2001) Trabeculectomy outcomes in advanced glaucoma in Nigeria. Eye 15: 274-278.
12. Ehrnrooth P, Lehto I, Puska P, Laatikainen L (2002) Long-term outcome of trabeculectomy in terms of intraocular pressure. Acta Ophthalmol Scand 80: 267-271.
13. Jacobi PC, Dietlein TS, Krieglstein GK (1999) Primary trabeculectomy in young adults: long-term clinical results and factors influencing the outcome. Ophthalmic Surg Lasers 30: 637-646.
14. Borisuth NS, Phillips B, Krupin T (1999) The risk profile of glaucoma filtration surgery. Curr Opin Ophthalmol 10: 112-126.
15. Koller TL, Sturmer J, Gloor B (1998) Risk factors for trabeculectomy failure, Klin Monbl Augenheilkd 213: 1-8.
16. Sergul S (1999) Vergleich des postoperativen Verlaufs nach Trabekulektomie bei Pseudoxfoliationslaukam und primäremchronischen Offenwinkelaukam. Klin Monatbl Augenheilkd 215: 281-286.
17. Kirwan JE, Lockwood AJ, Shah P, Macleod A, Broadway DC, et al. (2013) Trabeculectomy in the 21st Century: A Multicenter Analysis. Ophthalmology 120: 2532-2539.
18. Baser EF, Seymenoglu G, Mayali H (2011) Trabeculectomy for advanced glaucoma. Int Ophthalmol 31: 439-446.
19. Broadway CR, Clark A (2014) The Norwich Trabeculectomy Study: Long-term Outcomes of Modern Trabeculectory with Respect to Risk Factors for Filtration Failure. J Clin Exp Ophthalmol 5: 371.
20. Gyasi ME, Amoako WMK, Debrah OA, Awini EA, Abuari P (2006) Outcome of trabeculectomies without Adjunctive Antimetabolites. Ghana Med J 40: 39-44.
21. Quigley HA, Buhrmann RR, West SK, Isseme I, Scudder M, et al. (2000) Long term results of glaucoma surgery among participants in an east African population survey. Br J Ophthalmol 84: 860-864.