Trends of glaucoma surgery at a tertiary referral glaucoma clinic in Alexandria University Hospital

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Context
Glaucoma surgery aims to prevent visual loss from this blinding condition.
Aim
The aim of this research was to study the trends of glaucoma surgery in adults in a tertiary referral glaucoma centre in Alexandria University Hospital.
Setting and design
This is a retrospective study conducted in a tertiary referral glaucoma centre.
Patients and methods
Records of patients were retrospectively reviewed to study those undergoing surgery over a 10-year period from January 2007 to January 2017. The primary outcome measure was the intraocular pressure (IOP) – early postoperatively and at the last postoperative visit.
Statistical method used
The statistical methods were mean, SD, analysis of variance and post-hoc analysis.
Results
Sixty eyes of 51 patients underwent glaucoma surgery for uncontrolled IOP. Trabeculectomy was the most common procedure used, followed by synthetic Ahmed's valve. Mean preoperative IOP ranged from 17 to 66 mmHg with a mean of 36.7±11.19 mmHg. Early postoperative pressure ranged from 0 to 40 mmHg with a mean of 13.6±8.77 mmHg. Last visit postoperative pressure ranged from 0 to 46 mmHg with a mean of 15.2±9.35 mmHg. Pressure decreased significantly both early and late postoperatively from the preoperative levels. There was no significant change of IOP between the early and last postoperative visits.
Conclusion
A marked decrease in mean IOP was achieved both early and late postoperatively. The issue of poor registry keeping together with incomplete data recording was outstanding and needs to be addressed by the governing bodies to allow more robust analysis and comparison of outcomes.

Keywords:
glaucoma, intraocular pressure, trabeculectomy

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Introduction

Chronic glaucoma is one of the top leading causes of irreversible blindness worldwide. The number of the world population suffering from glaucoma has been estimated as 64.3 million. By 2040, the number is expected to reach 111.8 million [1]. Surgical management of uncontrolled glaucoma has usually been a last resort to failed medical treatment especially in the face of availability of several ocular hypotensive topical medications [2]. However, surgery is frequently needed to save vision, as medications still have many problems [3]. The aim of this retrospective study was to review the trends of adult glaucoma surgery in a tertiary referral glaucoma centre.

Patients and methods

The medical records for patients attending a tertiary referral glaucoma clinic in the outpatient ophthalmology department were reviewed to study those undergoing glaucoma surgery. Existing records for adults who underwent surgery were studied in this retrospective study. The main outcome measure was level of intraocular pressure (IOP) achieved at the early and last postoperative visit. The study period extended from January 2007 to January 2017. Available data were analysed and level of IOP at the last preoperative visit was recorded, as well as the early postoperative and last visits. Early postoperative pressure visit was considered to be within 2–5 weeks postoperatively, as patients differed in the timings of their visits. Pressure was recorded as measured with applanation tonometer; in cases in which pressure was recorded as 'soft' in the patients' record, it was given a value of zero in this study.

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In instances in which pressure was found to be recorded as 'less than', it was given the numeric digit value just before it. Patients reinstituted on topical ocular hypotensives by the last postoperative visit were identified.

Statistical analysis was done using Statistical Package for Social Sciences (SPSS, version 20; SPSS Inc., Chicago, USA) software. Mean and SD for numerical data were performed, excluding the outliers as in the case of visual acuity being hand motion. To compare more than two groups, analysis of variance test was used followed by post-hoc test to determine the difference between each two groups. The level of significance was 0.05.

Results

During the 10-year period studied, records were found for 51 patients who underwent glaucoma surgery. A total of 60 procedures were performed. Seven patients had bilateral surgery and two patients had a reoperation. Mean age was 49±16 years, ranging 14–75, with 22 males and 29 females (Table 1). Twenty-five eyes had chronic narrow-angle glaucoma, six had primary open-angle glaucoma, five had juvenile glaucoma, three had pseudophakic glaucoma, three had postvitrectomy, two had aphakic glaucoma, two had steroid-induced glaucoma, two had postrupture glaucoma, two had postcongestive glaucoma, two had pseudoexfoliation, two had uveitic glaucoma, one angle recession glaucoma, one had silicone-oil-induced glaucoma, one had postdetachment surgery, one had postbuckle glaucoma, one had postkeratoplasty glaucoma, one had neovascular glaucoma and one had plateau iris syndrome (Table 2). All patients underwent surgery after maximal tolerated topical medical therapy failed to achieve target pressure. Duration of last postoperative visit ranged from 0.17 to 6.75 years with a mean of 1.97±1.66 years. Ten patients had a vision of hand movement and thus they were excluded from visual acuity mean calculations (Table 3). Forty-six trabeculectomies were performed, all with releasable sutures; 34 of them were augmented with intraoperative application of mitomycin C. Two of these trabeculectomies were combined with trabeculotomy. There were an additional three phacotrabeculectomies, and 11 synthetic Ahmed valve procedures. All trabeculectomies were done using a fornix-based approach. Advanced glaucomatous cupping of 0.9–1.0 cup/disc ratio was present in 39 eyes (Table 4). Mean preoperative IOP ranged from 17 to 66 mmHg with a mean of 36.7±11.19 mmHg. Early postoperative pressure ranged from 0 to 40 mmHg with a mean of 13.6±8.77 mmHg. Last postoperative pressure ranged from 0 to 46 mmHg with a mean of 15.2±9.35 mmHg

Table 1 Distribution of studied cases according to demographic data

	n (%)
Age (years)	
<30	7 (7.8)
30–39	4 (15.7)
40–49	7 (13.7)
50–59	14 (27.4)
>59	15 (29.4)
Sex	
Male	22 (43.1)
Female	29 (56.9)
Laterality	
Unilateral	44 (86.2)
Bilateral	7 (13.7)
Number of patients	51 (100.0)

Table 2 Aetiological subtypes of glaucoma in the studied cases

Aetiologies	*n* (%)
Chronic narrow-angle glaucoma	25 (49)
Primary open-angle glaucoma	6 (11.7)
Juvenile	5 (9.8)
Pseudophakic	3 (5.8)
Postvitrectomy	3 (5.8)
Aphakic	2 (3.9)
Steroid induced	2 (3.9)
Postrupture globe	2 (3.9)
Postcongestive	2 (3.9)
Pseudoexfoliation	2 (3.9)
Uveitic	2 (3.9)
Angle recession	1 (1.96)
Silicone oil induced	1 (1.96)
Postdetachment surgery	1 (1.96)
Postbuckle	1 (1.96)
Postkeratoplasty	1 (1.96)
Neovascular	1 (1.96)
Plateau iris syndrome	1 (1.96)

Table 3 Visual acuity and follow-up duration of the studied cases

	n (%)
Visual acuity (log mar)	
<0.5	14 (23.7)
0.5–1	11 (18.6)
>1	24 (40.7)
HM	10 (16.9)
Range	0–1.8
Mean±SD	0.88±0.55
Duration of follow-up (years)	
<1	21 (35.0)
1–3	25 (41.7)
4+	14 (23.3)
Range	0.17–6.75
Mean±SD	1.97±1.66

HM, hand motion.

(Fig. 1). IOP decreased significantly both early and late postoperatively from the preoperative levels (P=0.0001). There was no significant change of IOP between the early and last postoperative visits (Table 5).

Releasable sutures were removed in eighteen eyes and needling with 5-fluorouracil was used in seven eyes. One aphakic patient with valve needed laser anterior hyaloidotomy for anterior vitreous face-induced postoperative pupillary block. Two patients developed minimal hyphema that rapidly resolved. Two patients had retinal haemorrhages. There were two cases of choroidal detachment, one of which was bullous and resolved without surgical intervention. One valve tube was in corneal stroma. Two eyes needed a reoperation: one underwent a retrabeculectomy and one a synthetic valve. One patient developed late postoperative fungal hypopyon corneal ulcer. In one case of synthetic valve, the end of the tube retracted into the corneal stroma. Bleb was diffuse in twenty nine eyes, cystic in six, localized in one, flat in three eyes and scarred in one eye. Twenty eyes used two topical ocular hypotensive medications preoperatively, five of them used one drug, eight eyes used four drugs and the remaining used three drugs. Postoperatively, 23 eyes used topical antiglaucoma drops (38.0% of eyes). Four of them used one drug, eight used two drugs, five used three drugs, one used five drugs and no data were found for the number of drugs for the remaining five eyes (Table 4).

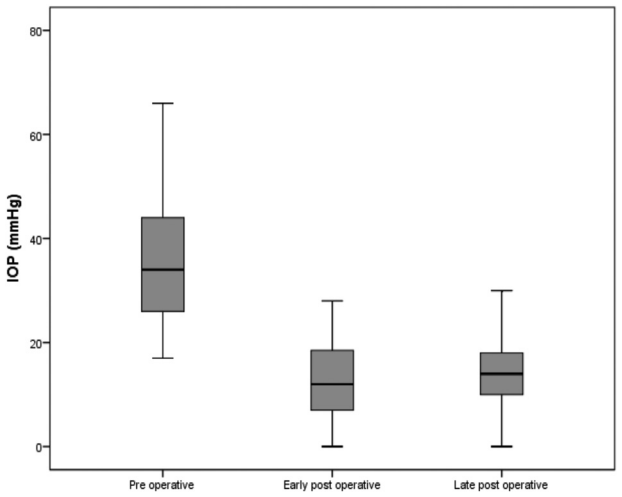
Table 4 Clinical characteristics of the cases

	Number of eyes [*n* (%)]
Cup/disc ratio	
1	27 (45)
0.9	12 (20)
0.8	4 (6.6)
0.7	1 (1.6)
0.6	1 (1.6)
0.5	1 (1.6)
0.4	2 (3.2)
0.3	3 (5)
0.2	1 (1.6)
Preoperative antiglaucoma drops	
Three drugs	27 (45)
Two drugs	20 (33)
Four drugs	8 (13.2)
One drug	5 (8.3)
Surgical procedure	
Trabeculectomy	46 (76.6)
Phacotrabeculectomy	3 (5)
Valve	11 (18.3)
Postoperative adjustments and complications	
Removal of releasable sutures	18 (30)
5-Fluorouracil needling	7 (11.6)
Reoperation	2 (3.2)
Nd YAG anterior hyaloidotomy	1 (1.6)
Hyphema	2 (3.2)
Retinal haemorrhages	2 (3.2)
Choroidal detachment	2 (3.2)
Tube in corneal stroma	1 (1.6)
Late fungal hypopyon ulcer	1 (1.6)
Bleb morphology	
Diffuse	29 (48.3)
Cystic	6 (10)
Flat	3 (5)
Localized	1 (1.6)
Scarred	1 (1.6)
Postoperative reinstitution of topical antiglaucoma agents	23 (38.3)
One drug	4 (6.4)
Two drugs	8 (12.8)
Three drugs	5 (8.3)
Five drugs	1 (1.6)

Discussion

In this retrospective study, mean IOP decreased from 36.73 to 13.57 and 15.17 mmHg in each of the early and last postoperative visits, respectively, after glaucoma surgery in a tertiary referral glaucoma clinic. De Smedt

Figure 1



Box plot graph showing the intraocular pressure (IOP) (mmHg) preoperatively, early postoperatively and late postoperatively.

Table 5 Comparison between intraocular pressure (mmHg) preoperatively, early postoperatively and late postoperatively (*n*=60 eyes)

	Preoperative IOP (mmHg)	Early postoperative IOP (mmHg)	Late postoperative IOP (mmHg)
Range	17–66	0–40	0–46
Mean	36.73	13.57	15.17
SD	11.19	8.77	9.35
P^1	–	0.0001*	0.0001*
P^2	–	–	0.395

IOP, intraocular pressure. P^1: difference between preoperative IOP and each of early and late postoperative IOP. P^2: difference between early and late postoperative IOP. *Significant at level $P \leq 0.05$.

et al. [4] reported a similar decrease in mean IOP from 31 to 13 mmHg after trabeculectomy. The total number of surgeries over the 10-year period was 60 procedures, which is a relatively small number in relation to the number of glaucoma patients attending the glaucoma clinic, reflecting a trend towards an increase in the role of topical medical treatment of glaucoma versus surgery. This trend is actually internationally reported [5]. This has not been the case in the government sector previously because of limited resources. However, in the past decade, availability of large amounts of charity donations made it possible to supply the poorer patients with costly topical ocular hypotensive drugs on a continuous basis. Regarding the aetiology of glaucoma in the study cases, it is noteworthy that 50% had primary angle closure glaucoma (PACG), whereas only 12% were diagnosed with primary open-angle glaucoma. This is in contrast to the relative prevalence of primary open-angle glaucoma compared with PACG in the USA, which has been reported to be 32 : 1 [6]. Meanwhile, in concordance with the current study, 86% of people with PACG are in Asia, with 48% in China [1]. The duration to last visit varied widely across the patients, ranging from 2 months to 7 years, with a large SD. This reflects the big problem of poor adherence to postoperative visits in the government sector, especially in chronic life-long illnesses such as glaucoma. Two-thirds of the patients had advanced cupping and more than half of them presented with poor visual acuity, which still shows the well-known poor detection rate of chronic glaucoma, being asymptomatic [7,8]. Improving patients' awareness of glaucoma is a multinational target to help early detection and compliance [9].

Of the 60 surgical procedures performed, 49 (81%) involved a trabeculectomy, and there were 11 synthetic Ahmed valve procedures. Rodriguez-Una *et al.* [10] have also shown that trabeculectomy still remains the procedure of choice for most UK surgeons, especially in patients requiring a low IOP. In agreement, trabeculectomy was the most frequent incisional surgery as demonstrated by the RIGOR study group [11]. All trabeculectomies used a fornix-based approach, which was the surgeon's preference. Al-Haddad *et al.* [12] demonstrated a similar efficacy with respect to bleb failure or IOP control with either limbal-based or fornix-based approaches. However, a significant difference was detected in the risk of postoperative shallow anterior chamber, which was increased in the limbal-based approach. Releasable sutures were used in all trabeculectomies, and postoperative suture removal was needed in a third of them. The use of releasable sutures has been shown to have comparable efficacy and success rate to nonreleasable sutures, but with a significantly lower incidence of postoperative hypotony and flat anterior chamber [13]. This modality has been endorsed as a safe and effective technique [14]. Postoperative complications were rare and most of them were without sequelae, with a remarkably low rate of lost anterior chamber or bullous choroidal detachment despite the use of mitomycin C. However, a limitation of the current study is its retrospective nature and, most importantly, the big deficiency in completeness of patients' records. Therefore, some complications might have not been documented nor detected. It is noteworthy that Leeungurasatien *et al.* [15] found a high incidence of early complications after first time trabeculectomy with mitomycin, although most were transient and self-limited.

In the current study, IOP decreased significantly from a mean of 36.7±11.19 mmHg preoperatively to a mean of 13.6±8.77 mmHg in the early postoperative period. The decrease in IOP was maintained at the last postoperative visit at a mean of 15.2±9.35 mmHg. This mean drop in IOP of about 23 mmHg is a favourable outcome of the current study and represents a reduction of more than 60% from baseline. It is in agreement with, and in excess of, a mean drop of about 15 mmHg from preoperative levels after glaucoma surgery as reported by Leeungurasatien *et al.* [15]. It is also almost identical to the aforementioned results of De Smedt *et al.* [4]. Eleven synthetic Ahmed valve procedures were performed in the current study. The numbers were too few to do a valid comparison with trabeculectomy. The tube versus trabeculectomy study demonstrated a similar rate of complete success with both procedures [16]. Glaucoma drainage implants are now being used at an earlier stage than before as tissue-compatible materials and operative techniques were improved [17]. Postoperatively, topical antiglaucoma drops were reinstituted in 23 cases (38.0% of eyes). This represents a failure to achieve target pressure with surgery alone in those cases by the final postoperative visit. Therefore, although a mean IOP reduction of more than 60% from baseline was observed in the current study, more than one-third of the eyes required topical antiglaucoma medications at the end. This highlights the importance of patients' adherence to the lengthy postoperative follow-up duration, and of educating patients about the life-long nature of the disease.In conclusion, this retrospective study – despite its limitations – has highlighted the trends of surgical management of glaucoma at a tertiary referral centre over a decade. Trabeculectomy was the most common procedure

used, followed by synthetic Ahmed's valve. A significant and marked decrease in mean IOP was achieved both early and late postoperatively, although many patients were restarted on topical medications. Complications were rare and of transient self-limited nature in most cases. The issue of poor registry keeping together with incomplete data recording was outstanding and needs to be addressed by the governing bodies to allow more robust analysis and comparison of outcomes.

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Conflicts of interest
There are no conflicts of interest.

References

1 Tham YC, Li X, Wong TY, Quigley HA, Aung T, Cheng CY. Global prevalence of glaucoma and projections of glaucoma burden through 2040: a systematic review and meta-analysis. Ophthalmology 2014; 121:2081–2090.

2 European Glaucoma Society. Terminology and guidelines for glaucoma. 4th. European Glaucoma Society; 2015.

3 Loon SC, Jin J, Jin Goh M. The relationship between quality of life and adherence to medication in glaucoma patients in Singapore. J Glaucoma 2015; 24:e36–e42.

4 De Smedt SK, Fonteyne YS, Muragijimana F, Palmer K, Murdoch I. Glaucoma surgery outcome in Rwanda. J Glaucoma 2016; 25:698–703.

5 Conlon R, Saheb H, Ahmed II. Glaucoma treatment trends: a review. Can J Ophthalmol 2017; 52:114–124.

6 Cassard SD, Quiglet HA, Gower EW, Friedman DS, Ramulu PY, Jampel HD. Regional variations and trends in the prevalence of diagnosed glaucoma in the Medicare population. Ophthalmology 2012; 119:1342–1351.

7 Salam AA, Khalil T, Akram MU, Jameel A, Basit I. Automated detection of glaucoma using structural and non-structural features. Springerplus 2016; 5:1519.

8 Quaranta L, Riva I, Geradi C, Oddone F, Floriano I, Konstas AG. Quality of life in Glaucoma: a review of the literature. Adv Ther 2016; 33:982.

9 Kyari F, Nolan W, Gilobert C. Ophthalmologists' practice patterns and challenges in achieving optimal management for glaucoma in Nigeria: results from a nationwide study. BMJ Open 2016; 6:e012230.

10 Rodriguez-Una I, Azuara-Blanco A, King AJ. Survey of glaucoma surgical preferences and post-operative care in the United Kingdom. Clin Exp Ophthalmol 2016; 45:232–240.

11 Coleman AL, Lum FC, Velentgas P, Su Z, Gliklich RERiGOR Study Group. Practice patterns and treatment changes for open-angle glaucoma: the RiGOR study. J Comp Eff Res 2016; 5:79–85.

12 Al-Haddad CE, Abdulaal M, Al-Moujahed A, Evrin AM, Ismail K. Fornix-based versus limbal-based conjunctival trabeculectomy flaps for glaucgoma: findings from a cochrane systematic review. Am J Ophthalmol 2017; 174:33–41.

13 Zhou M, Wang W, Huang W, Zhang X. Trabeculectomy with versus without releasable sutures for glaucoma: a meta-analysis of randomised controlled trials. BMC Ophthalmol 2014; 14:41.

14 Duman F, Faria B, Rutnin N, Guzel H, Ekici F, Waisbourd M, *et al.* Comparison of 3 different releasable suture techniques in trabeculectomy. Eur J Ophthalmol 2016; 26:307–314.

15 Leeungurasatien T, Khunsongkiet P, Pathanapitoon K, Wiwatwongwana D. Incidence of short-term complications and associated factors after primary trabeculectomy in Chiang Mai University Hospital. Indian J Ophthalmol 2016; 64:737–742.

16 Gedde SJ, Schiffman JC, Feuer WJ, Herndon LW, Brandt JD, Budenz DL, *et al.* Treatment outcomes in the Tube Versus Trabeculectomy (TVT) study after five years of follow-up. Am J Ophthalmol 2012; 153:789–803j.

17 Rosentreter A, Strzalkowski P, Bula AM, Alnawaiseh M. Glaucoma drainage devices: tube versus trabeculectomy study. Klin Monbl Augenheilkd 2017; [Epub ahead of print].