



A Decade of Difference: A 10 Year Comparison of Trabeculectomy Surgery



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Introduction

- Trabeculectomy has evolved to become a safer procedure over the last 20 years, with comparatively lower complication rates whilst maintaining good intraocular pressure (IOP) outcomes [1].
- The procedure has more recently become more standardised and this has resulted in improved outcomes when compared to earlier studies, in particular the UK National Trabeculectomy Audit [2].
- Whilst comparing case series performed at varying institutions gives the impression that success rates and safety has improved, these types of analysis are confounded by many variables that hinder the formation of meaningful conclusions.
- Such factors include differing definitions of success, variation in surgical technique, intensity of post-operative manipulation, non-homogenous populations and surgeon preferences and
- experience.
- This paper aims to eliminate some of these factors by comparing the 2-year outcomes obtained from primary trabeculectomy from 2 cohorts, 10 years apart, performed at a large UK teaching eye hospital. This analysis also enables us to yield information about the changing trends in indications for trabeculectomy, to determine if the perceived increase in trabeculectomy safety has led to earlier surgical intervention in glaucoma.

Methods

Data Collection

- Clinical records were reviewed from patients undergoing primary trabeculectomy for the treatment of glaucoma at the Manchester Royal Eye Hospital over two separate periods, 10 years apart
- Cohort 1 underwent surgery between 1 August 2004 and 31 July 2005
- Cohort 2 underwent surgery between 1 Aug 2014 and 31 July 2015
- The review of records formed part of the audit process of the institution and had approval by the Audit Lead of the Manchester Royal Eye Hospital

Cases were excluded if:

- Records were unavailable – given surgery in Cohort 1 was over 10 years ago and some records had since been destroyed.
- Patients had undergone cyclodiode laser, ab-interno glaucoma stent insertion or any other incisional glaucoma procedures as the primary intervention. Those with a history of laser trabeculectomy, laser iridotomy or argon laser iridoplasty were included.
- Patients had aphakic, neovascular, congenital, juvenile or secondary (including uveitic and silicone oil induced) glaucoma.
- Patients had a follow-up period of less than 2 years

Results

TABLE 1. Ocular Characteristics

	Combined Groups (n=186)	Cohort 1 (n=52)	Cohort 2 (n=134)	P-Value
Diagnosis, n (%)				
POAG	112 (60%)	30 (58%)	82 (61%)	0.74*
NTG	28 (15%)	7 (13%)	21 (16%)	
PKG	6 (3%)	2 (4%)	4 (3%)	
PG	10 (5%)	2 (4%)	8 (6%)	
PACG	17 (9%)	5 (10%)	12 (9%)	
Uveitic	13 (7%)	6 (12%)	7 (5%)	
Pre-op IOP, mmHg				
At Diagnosis				
Mean ± SD	28 ± 9	28 ± 11	28 ± 8	0.62†
Range	12-69	12-69	12-57	
At Listing				
Mean ± SD	22 ± 8	24 ± 10	21 ± 7	0.01‡
Range	10-69	12-69	10-46	
Pre-Op Visual Acuity¹, LogMAR				
Mean ± SD	0.230 ± 0.326	0.241 ± 0.341	0.226 ± 0.321	0.28§
Range	<0.097-2	<0.097-2	<0.097-2	
Pre-Op Visual Field Mean Deviation, dB				
Mild	55 (30%)	18 (35%)	37 (31%)	0.21†
Moderate	36 (19%)	12 (23%)	24 (18%)	
Advanced	50 (27%)	8 (15%)	42 (31%)	
Severe	36 (19%)	9 (17%)	27 (20%)	
Unknown	7 (4%)	5 (10%)	2 (1%)	
Previous Surgery, n (%)				
Cataract	20 (11%)	8 (16%)	12 (9%)	0.72†
Conjunctival	1 (1%)	0 (0%)	1 (1%)	
Vitreous/vitreal	1 (1%)	0 (0%)	1 (1%)	
Other	4 (2%)	1 (2%)	3 (2%)	
None	155 (83%)	42 (81%)	113 (84%)	
Unknown	5 (3%)	1 (2%)	4 (3%)	
Topical Pre-Op Medications, n (%)				
One	15 (8%)	4 (8%)	11 (8%)	
Two	46 (25%)	16 (31%)	30 (22%)	
Three	71 (38%)	21 (40%)	50 (37%)	
Four	54 (29%)	11 (21%)	43 (32%)	
Mean ± SD	2.88 ± 0.92	2.75 ± 0.88	2.93 ± 0.94	0.18§
Risk Factors for Failure, n (%)				
OSD	14 (8%)	5 (10%)	9 (7%)	0.17†
Uveitic Glaucoma	14 (8%)	6 (12%)	8 (6%)	
Ethnicity	7 (4%)	2 (4%)	5 (4%)	
Other	7 (4%)	4 (8%)	3 (2%)	
None	144 (77%)	35 (67%)	109 (81%)	

*Pre-operative IOP data was not available for 3 patients in Cohort 1 and 1 patient in Cohort 2

†Pre-operative visual acuity data was not available for 3 patients in Cohort 1 and 1 patient in Cohort 2

TABLE 2. Demographic Characteristics

	Combined Groups (n=186)	Cohort 1 (n=52)	Cohort 2 (n=134)	P-Value
Age at Listing, years				
Mean ± SD	65 ± 13	63 ± 15	66 ± 12	0.15*
Range	19-89	23-82	19-89	
Gender, n (%)				
Male	89 (48%)	24 (46%)	65 (49%)	0.87
Female	96 (52%)	28 (54%)	68 (51%)	
Unknown	1 (1%)	0 (0%)	1 (1%)	
Race, n (%)				
Caucasian	170 (91%)	48 (92%)	122 (91%)	0.85*
Asian-Indian	5 (3%)	2 (4%)	3 (2%)	
Afro-Caribbean	7 (4%)	1 (2%)	6 (4%)	
Asian-Oriental	3 (2%)	1 (2%)	2 (1%)	
Other	1 (1%)	0 (0%)	1 (1%)	

TABLE 3. Surgery Details

	Combined Groups (n=186)	Cohort 1 (n=52)	Cohort 2 (n=134)	P-Value
Time from Diagnosis to Listing, years				
Mean ± SD	6.3 ± 6.6	3.5 ± 3.8	7.2 ± 7	<0.0001†
Range	0-49	0-18	0-49	
Surgeon Specialty, n (%)				
Glaucoma	135 (73%)	34 (68%)	101 (80%)	<0.0001†
Other	19 (10%)	16 (32%)	3 (2%)	
Surgeon Grade, n (%)				
Consultant	71 (38%)	30 (58%)	41 (31%)	<0.0001†
Fellow	60 (32%)	11 (21%)	49 (37%)	
Trainee	10 (5%)	5 (10%)	5 (4%)	
Combined	43 (23%)	4 (8%)	39 (29%)	
Unknown	2 (1%)	2 (4%)	0 (0%)	
Indication, n (%)				
Medication Failure	140 (75%)	46 (88%)	94 (70%)	0.02†
Medication Intolerance	34 (18%)	8 (15%)	26 (19%)	0.62†
Poor Compliance	4 (2%)	0 (0%)	4 (3%)	0.58*
Progressive OD Changes	135 (73%)	21 (40%)	114 (85%)	<0.0001†
Progressive VF	129 (69%)	28 (54%)	101 (75%)	0.01†
Deterioration				
Intra-Op Anti-Metabolite, n (%)				
S-FU	32 (17%)	32 (62%)	0 (0%)	<0.0001†
MMC - 0.2mg/ml	72 (39%)	6 (12%)	66 (49%)	
MMC - 0.4mg/ml	77 (41%)	10 (19%)	67 (50%)	
Unknown	5 (3%)	1 (2%)	4 (3%)	
Number of Releasable Sutures Used, n (%)				
Two	6 (3%)	3 (6%)	3 (2%)	0.19§
Three	176 (95%)	45 (87%)	131 (98%)	
Unknown	4 (2%)	4 (8%)	0 (0%)	

*Time from Diagnosis to Listing was not available for 3 patients in Cohort 1

†Time from Diagnosis to Listing was not available for 3 patients in Cohort 1 and 1 patient in Cohort 2

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TABLE 4. 2-Year Outcomes

	Combined Groups (n=172)	Cohort 1 (n=46)	Cohort 2 (n=126)	P-Value
Success, n (%)				
Unqualified	133 (77%)	37 (80%)	95 (75%)	0.63†
Qualified†	32 (19%)	2 (5%)	30 (24%)	0.01†
Stratified Success, n (%)				
IOP ≤26mmHg, ≤21mmHg & ≥20% decrease	132 (77%)	37 (80%)	95 (75%)	0.63†
IOP ≤26mmHg, ≤18mmHg & ≥20% decrease	123 (72%)	35 (76%)	88 (70%)	0.54†
IOP ≤26mmHg, ≤16mmHg & ≥20% decrease	113 (66%)	35 (76%)	78 (62%)	0.12†
2-Year IOP, mmHg				
Mean ± SD	13 ± 4	13 ± 5	13 ± 4	0.35†
Range	5-34	6-34	5-29	

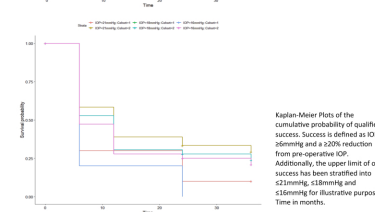
*Qualified success data was available for 43 patients in Cohort 1

TABLE 5. Post-Operative Interventions

	Combined Groups (n=186)	Cohort 1 (n=52)	Cohort 2 (n=134)	P-Value
Post-Operative Injection Use¹, n (%)				
Needling Antimetabolite	60 (32%)	29 (56%)	37 (28%)	0.0006†
S-FU (Type 1) ²	18 (10%)	11 (21%)	7 (5%)	0.009†
S-FU (Type 2) ²	2 (1%)	1 (2%)	1 (1%)	
MMC (Type 1)	5 (3%)	0 (0%)	5 (4%)	
MMC (Type 2)	6 (3%)	0 (0%)	6 (4%)	
Post-Operative S-FU Clinic: Injection Only, n (%)				
One Attendance	21 (11%)	8 (15%)	13 (10%)	<0.0001†
Two Attendances	16 (9%)	4 (8%)	12 (9%)	
Three Attendances	8 (5%)	2 (4%)	6 (5%)	
Four Attendances	3 (2%)	2 (4%)	1 (1%)	
Five Attendances	6 (3%)	6 (12%)	0 (0%)	
None	128 (69%)	24 (46%)	104 (78%)	
Post-Operative S-FU Clinic: Injection and Needling, n (%)				
One Attendance	19 (10%)	2 (4%)	17 (13%)	0.18†
Two Attendances	9 (5%)	1 (2%)	7 (5%)	
Three Attendances	5 (3%)	0 (0%)	5 (4%)	
Four Attendances	3 (2%)	0 (0%)	3 (2%)	
Five Attendances	0 (0%)	0 (0%)	0 (0%)	
None	152 (82%)	48 (92%)	104 (78%)	
Releasable Suture Removal, n (%)				
One	176 (95%)	46 (88%)	130 (97%)	0.22†
Two	171 (92%)	43 (83%)	128 (96%)	0.46†
Three	167 (90%)	42 (81%)	125 (93%)	0.82†
Four	5 (3%)	2 (4%)	3 (2%)	0.61†
None	2 (1%)	2 (4%)	0 (0%)	

*Post-operative injection use data was not available for 18 patients in Cohort 2

†Type 1 refers to needling performed solely in the subconjunctival space. Type 2 refers to needling performed in the subconjunctival space and within the sub-levator flap. Type 3 needling can also involve entry into the anterior chamber in certain cases.



Discussion

- The number of surgeries being performed for glaucoma is decreasing in the western world, with the advent of better medical management options [3-5]. Indeed, our study reflects this trend as the average time from diagnosis to listing for patients undergoing surgery in Cohort 1 (2004/2005) was 3.5 ± 3.8 years (mean ± SD), compared to 7.2 ± 7 years in Cohort 2 (2014/2015) (P<0.0001).
- Furthermore, there was greater pre-operative IOP control in Cohort 2, listing IOP being 21 ± 7 mmHg, versus 24 ± 10 mmHg for Cohort 1 (P=0.01).
- There was also evidence of a shift in indications for operation. Cohort 1 had a statistically greater number of operations being performed due to medication failure, 88%, versus 70% in Cohort 2 (P=0.02).
- Progression in optic disc changes and deterioration of visual fields was a significantly more common indication for surgery in Cohort 2, 85% and 75% of cases, versus 40% and 54% in Cohort 1 (P<0.0001; P=0.01), respectively.
- Determination of the ideal intra-operative anti-metabolite has been the topic of significant research [6-10]. Indeed, there has been a relative shift in the choice of intra-operative antimetabolite with MMC gaining preference over S-FU [1]. In our study, all procedures in Cohort 2 used only MMC intraoperatively... 62% of procedures in Cohort 1, however, involved the use of S-FU (P<0.0001). A statistically significant decline in the need for post-operative injections in Cohort 2 may be explained by the predominance of intraoperative MMC use in that cohort (P=0.006).
- The need for clinic or theatre needling, however, has remained level between the two groups.
- Although numerous changes in practice have occurred between 2004/5 (Cohort 1) and 2014/15 (Cohort 2) in light of evolving evidence, statistically significant results have not been observed in the rates of complications or unqualified success.
- In conclusion, MMC has replaced S-FU as the intra-operative antimetabolite with resulting similar IOP success rates but a lower degree of post-operative antimetabolite administration.

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