Assessment of Visual Gain Following Cataract Surgeries in Oman: A Hospital-Based Cohort Study

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Abstract

Objectives: The post-operative vision is used as benchmark to determine the quality of cataract surgery. However, late presentation and co-morbidities influence the visual gain and they should also be considered while auditing cataract surgeries. The authors present method of analysis of cataract surgeries for older than 30 years of aged patients performed by ophthalmologists in Oman during 2003.

Methods: Ophthalmologists evaluated visual and ocular status of eyes with cataract. Cataract was operated using operative microscope and lens was implanted in the eye. The vision was recorded six weeks after surgery and visual gain was grouped from postoperative vision in relation to the preoperative vision. Presence of co-morbidities like glaucoma, corneal opacities, macular degenerations and others were considered while evaluating visual outcomes.

Results: 3,485 eyes operated were included in our study. 3,003 (86.2%) of them were operated by extra-capsular cataract extraction and lens implantation. Following surgery, 960 (27.5%) eyes had vision ≥6/18. 1,483 (42.6%) eyes had vision between 6/60 and 6/18. 233 (6.8%) eyes had vision <3/60. Excellent grade of vision gain in relation to preoperative visual status was found in 2,250 (64.6%) eyes, 'good' visual gain was in 422 (12.1%) eyes and 'poor' visual gain was in 335 (9.6%) eyes. Postoperative visual status was significantly associated to the co-morbidities. ($p<0.001$). Nearly 14% of persons were lost to the follow up.

Conclusion: In countries like Oman with high prevalence of trachoma, glaucoma and diabetes, the proposed grading of visual gain that accounts for the preoperative vision and the presence of co-morbidity could be better option for auditing the cataract surgery.

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Received: 22 Sep 2008
Accepted: 25 Nov 2008

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Introduction

Cataract is the leading cause of blindness globally.[1] It is the second most cost effective public health intervention following immunization to prevent communicable infection.[2] In addition to increase cataract surgery rates, it is important that high quality is maintained to achieve targets related to the VISION 2020 initiative.[3] Performing surgical audit is one of the methods of the quality control. Visual outcome following eye surgery is of utmost importance both for the clients and for the care providers. Hence to assess quality of cataract surgery, indicators like the proportion of lens implantation and the visual gains following surgery are crucial.[4] World Health Organization (WHO) categorized visual outcome following cataract surgery as 'excellent' (>6/18), 'Good' (6/18 to 6/60) and 'Poor' (<6/60).[5] However, they are exclusively based on the post-operative vision. The risk factors that are related to poor outcomes like presence of co-morbidities, late presentation for eye surgeries need to be considered.

In Oman, un-operated cataract was the principal cause for 35% of the estimated blind.[6] The national cataract surgery rate was 2,120/million in 2003.[7] This is much lower than other countries like Australia, India and many other industrialised countries.[8] The organized approach for addressing cataract in Oman includes surgical audit of all operated cataract cases since 2000. However, ophthalmologists face difficulties to attain the WHO recommended criteria (more than 85% of operated eyes should have >6/18 vision at six week following cataract surgery). This is due to high rates of trachomatous corneal opacities, diabetes and presenting for cataract surgery in advanced stage. As per the ophthalmologist's suggestion, the standard cataract surgery audit,[9] was modified in Oman. The authors present outcomes of surgical audit of cataract surgeries using different type of indicators to assess visual gain.

Methods

This was a hospital based historical cohort study. The study was undertaken in 2003. Permission of health authorities was obtained for this operational research. Patients having cataract

as the principal cause for their visual impairment and scheduled for the surgery during the study period were approached for the enrolment. Their verbal consent for participation was obtained.

This study was conducted at ten hospitals. Although surgical audit is performed for all cases of cataract, for this study, we included only cases aged more than 30 years of age at the time of surgery and had either visual acuity less than 6/60 in eye due to cataract or few other persons with visual acuity between 6/18 to 6/60 and they had problems due to central cataract. All these cases had dimness of vision due to cataract.

Our sample covers all the cases operated in nine of the regional hospitals of the Ministry of Health, Oman. Only one of these centres is a tertiary eye care unit in Muscat; the capital. The other hospitals with surgical facilities are situated in major towns and thus rural population have easy access to these facilities. Our cohort included all the cataract surgeries carried out in these hospitals during 2003 and also few that were operated in 2002 but followed during 2003.

Ophthalmologists, optometrists & regional eye health care supervisors were our study staff. Ophthalmologists evaluated status of each eye by using Bio-microscope, applanation tonometer and pan retinal indirect ophthalmoscope. The vision was tested with the help of Snellen's distant vision chart. Optometrists performed manual refraction to determine best possible correction six weeks after surgery. The power of the lens to be implanted in eye was determined with the help of ultrasound 'A' scan. Anesthetist advised laboratory investigations and conducted physical check up in detail prior to the surgery. A standard computerised case record of each cataract case was maintained in hospitals.

A patient with cataract is routinely operated under operative microscope. Capsulorrhexis is performed and 'in bag' intra-ocular lens is implanted. In limited cases with dense corneal opacity, proper visualisation of surgical steps was not possible. Hence ophthalmologists performed extra-capsular cataract extraction and placed the lens in the posterior chamber. They rested the lens with support of the posterior capsule but these lenses were not fixed at sulcus with sutures. Few cases were operated by intra-capsular method also. In most of the cases, five interrupted 10/0 nylon sutures were used to close the corneal incision.

The presenting and the best possible corrected vision of operated eye was assessed in ophthalmic clinic on the day of discharging from hospital, on 1st follow up after one week of surgery and finally after 6 to 8 week of surgery.

The visual gain was measured using WHO recommended method of using post operative visual status at 6 to 8 week following cataract surgery. We used revised criteria in which preoperative vision in the eye to be operated for cataract was accounted while grading the visual gain. If preoperative vision was <3/60 and the postoperative vision was between 6/6 and 6/24, we considered as excellent visual gain. This was in addition to the criteria set by WHO (Vision >6/24 at 6 to 8 weeks following surgery irrespective of preoperative vision). In the eyes with <3/60 vision if following surgery vision improved to >3/60, we included such cases into 'good' visual gain. The eyes with<3/60 vision before and after surgery were grouped into 'poor' visual gain.

The health regions of Oman were divided into Group 'A' & 'B', based on the availability of evolved cataract surgery services. 'Group A' that included Muscat, Dhofar and Dhahira regions had such services even before 1990. While other regions; Dhakhiliya, North Sharqiya, South Sharqiya, North Batinah, South Batinah and Musundam were having such services in last ten years and they were included in 'Group B'.

We did not collect information on operative and post operative complications and refractive status of operated eye while assessing best corrected vision at 6 to 8 weeks.

A pre-tested form was used to collect the data from the computer case record. This was collected before surgery within one week of surgery and at the time of follow up 6 to 8 weeks after surgery. Age and gender of patient, preoperative vision of eye operated, presence of ocular and systemic co-morbidities that may affect visual outcome were independent variables that we noted.

The data was entered on worksheet (Microsoft XL). Analysis was conducted using Statistical Package for Social Studies (SPSS 9). We used univariate analysis for the parametric type of analysis. We calculated frequency and percentages of the visual gain.

Identity of the operated person as well as surgeon was kept confidential. Pre-operative, intra-operative and postoperative eye care to all subjects was given free of charge.

Results

3,645 eyes with cataract were operated during the study period. We included data of 3,485 eyes of persons with >30 years of age. The profile of the examined sample is given in Table 1. In 2,935 (84.2%) eyes, Extra-capsular Cataract extraction (ECCE) with Intra Ocular Lens (IOL) implantation was the surgery performed. Further details about type of cataract surgery are given in Table 2.

Table 1: Profile of the patients operated for cataract (Oman cataract audit study)

Variables		Eyes	Percent
Gender	Male	1,728	49.60
	Female	1,757	50.40
Age group	30 to 39	67	1.90
	40 to 49	496	14.20
	50 to 59	1077	30.90
	60 to 69	1232	35.40
	70 to 79	456	13.10
	80 & above	157	4.50
Laterality	Right	1,717	49.30
	Left	1,768	50.70
Region	Group A	1,359	39.00
	Group B	2,126	61.00
Pre-operative vision	6/60 to 6/18	140	4.00
	3/60 to 6/60	396	11.40
	<3/60	2,806	80.50
	Missing	143	4.10
Principal co-morbidities	Glaucoma	229	6.60
	Trachomatous corneal opacity	377	10.80
	Non-trachomatous corneal	423	12.10
	diseases	12	0.30
	Myopia with degeneration	10	0.30
	Optic atrophy	16	0.50
	Diabetic retinopathy	4	0.10
	Chorioretinitis	12	0.30
	Macular degeneration	35	1.00
	Other	5	0.14
	Dislocated/subluxated lens	15	0.40
	Psudoexfoliation	2,343	67.20
	No major co-morbidity recorded		

Table 2: Cataract surgeries by type

Type of cataract surgery	Number of eyes	Percent
ECCE with IOL	2,935	84.20
ECCE without IOL	62	1.80
0ICCE	350	10.00
Phacoemulsification + IOL	6	0.20
ECCE + AGS	128	3.70
Other	4	0.10
Missing	143	4.10
Total	3,485	100.00

ECCE: Extra-capsular Cataract Extraction; IOL: Intra ocular lens; ICCE: Intra-capsular Cataract Extraction; AGS: Anti-Glaucoma Surgery

We compared the best corrected vision before and 6 to 8 weeks after cataract surgery. (Figure 1) Patients were seeking surgery in late stages of visual disabilities in many patients. In 151 (4.3%) eyes preoperative vision was not mentioned while 478 (13.7%) cases were lost to final follow up.

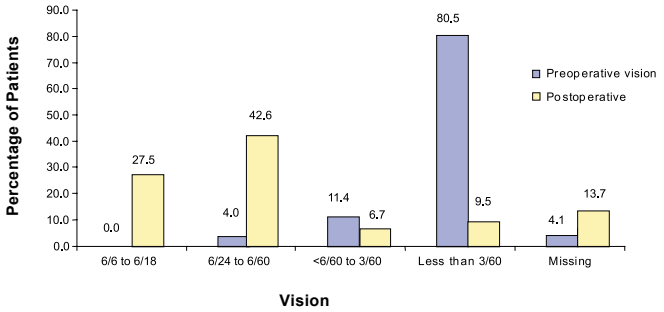

Figure 1: Comparison of best corrected vision before and six to 8 weeks after cataract surgery in >30 years old patients in Oman in 2003.

The quality of the cataract surgery was assessed using the World Health Organization recommended method. The best corrected visual acuity of 'Excellent' grade at 6 to 8 weeks following cataract surgery was noted in 960 (27.5%) eyes only (Table 3).

Table 3: Best corrected visual acuity at 6 to 8 weeks after cataract surgery

Post-operative vision	Number of eyes	Percent	95% Confidence interval
6/18 to 6/6	960	27.50	24.70-30.40
6/60 to 6/24	1,483	42.60	40.00-45.10
3/60 to 6/60	233	6.70	3.50- 9.90
<3/60	331	9.50	6.30-12.70
Missing	478	13.70	10.60-16.80
Total	3,485		

The visual gain was calculated by using preoperative visual status as reference and then grouped into 'Excellent' 'Good' and 'Poor' categories. (Table 4) Visual gain was of 'excellent' grade in 2,430 (69.7%) of operated eyes. Visual gain was 'good' in 442 (12.1%) eyes and 'Poor' grade in 335(9.6%).

Table 4: Postoperative visual gain by preoperative visual status

	Best corrected vision 6 to 8 weeks after cataract surgery					
Preoperative Vision	**6/18 to 6/6 Excellent (WHO)**	**6/60 to 6/24 Good (WHO)**	**3/60 to 6/60 Poor (WHO)**	**<3/60 Poor (WHO)**	**Missing**	**Total**
6/6 to 6/18	0	0	0	0	0	0
6/60 to 6/18	84 (2.4%)	31 (0.9%)	2 (0.1%)	2 (0.1%)	21 (0.6%)	140
3/60 to 6/60	206 (5.9%)	162 (4.6%)	2 (0.1%)	0	26 (0.7%)	396
<3/60	652 (18.7%)	1,270 (36.4%)	229 (6.6%)	324 (9.3%)	331 (9.5%)	2,806
Missing	18 (0.5%)	20 (0.6%)	0	5 (0.1%)	100 (2.9%)	143
Total	960	1,483	233	331	478	3,485

Excellent	Good	Poor
2,250 (64.6%)	442 (12.1%)	335(9.6%)

The presence of co-morbidities that were noted prior to surgery in our operated cohort was also evaluated. (Table 5) Visual gain was significantly better among eyes without co morbidities.

Table 5: Visual Gain 6 to 8 weeks after surgery and preoperative ocular co-morbidities

Co-morbidity	**'Excellent' Visual Gain**		**'Good' + 'Poor' Visual gain**		
	Number	**Percent**	**Number**	**Percent**	
Glaucoma	138	11.20	91	4.00	
Corneal Pathology	403	32.60	398	17.70	
Trachomatous corneal opacity	207		170		
Non-Trachomatous corneal diseases	195		228		
Post segment diseases	30	2.40	24	1.10	$X^2 = 235.6$ Degree of freedom = 4 p value <0.001
Optic atrophy	9		1		
Myopic degeneration	5		7		
Diabetic Retinopathy	4		12		
Chorioretinitis	4		0		
Age Related Macular degeneration	8		4		
Other	34	2.80	25	1.10	
No morbidity reported	630	51.10	1,713	76.10	
Total	1,234		2,251		

Discussion

The cataract surgery audit is an important step to introspect and on its basis one can take action to improve the cataract services. By using WHO recommended methods of audit, we found that only 28% of operated eyes in our study had 'excellent' grade of vision. As modern surgical facilities are available in regional hospitals and eye care is offered by experienced ophthalmologists in Oman, the low rate of visual gain were not expected and are difficult to explain.

Vision after cataract surgery could be compromised due to other eye diseases. Unfortunately this is not considered while performing cataract surgery audit. In this study we used preoperative vision as a proxy indicator of co-morbidity and altered the method of calculating postoperative visual gain. If vision in eye with poor preoperative vision is regained, such cases were given more credit and were included in the 'excellent' grade of visual gain. As per this revised calculation, 'excellent' grade of visual gain was 64.6% of operated eyes in our study. As expected, there was strong association of poor visual gain to the presence of ocular co-morbidity.

The visual gain in our study is much less than that reported in China,[5] India,[2] Nepal,[6] Hong Kong,[7] Brazil,[8] and South India.[9] But was at par with the results of Bangladesh.[10]

In our study, 80% of the patients had visual acuity of < 0.05 at the time of surgery. High rate of illiteracy in elderly population and lack of awareness about undergoing cataract surgeries on time could be responsible for late presentation. Hot sunny climate, higher rates of diabetes,[3] trachoma,[4] and glaucoma[10] in Omani community could be responsible for higher proportions of co-morbidities in patients with cataract.

In view of late presentations and higher rates of co-morbidities, 64.6% eyes with excellent grade of vision after cataract surgery might be justified. But good and poor vision in large number of cases without ocular co-morbidity is a matter of concern. This could be due to missed co-morbidities, poor case records or presence of a learning curve among ophthalmologists. More detailed audit in each eye department is recommended to find out the underlying causes of these discrepancies.

Promotion of cataract surgeries at earlier age, proper preoperative counselling for limiting expectations of visual gains in case of co-morbidity should be the standard operating procedure that all eye care staff should follow. Simultaneous management of co-morbidities like glaucoma, pterygium, and central corneal opacities should be planned for visual gain during cataract surgeries.

Low vision outcome following cataract surgery could be one of the barriers for increasing cataract surgery rates. Dissatisfied patients often spread negative messages and thus prospective cataract patients either delay their surgeries due to fear or opt for surgery elsewhere. The program aiming to eliminate avoidable blindness mainly due to cataract could face set back if such low visual outcomes are not addressed.[11]

The client perspective about their visual expectation was studied in Oman and interestingly it was found that a person with very good visual gain may be unhappy while marginal increase in visual acuity could satisfy other patient operated for cataract.[12]

Our study had few limitations. Proper recording of operative and immediate post operative complications were missing. Hence association of visual gain with these important indicators of deficiency on part of providers could not be established. A large number of cases were lost to follow up. If all of them were either having very poor vision and had not come to same surgeon for follow up, the visual gain would be worse. If we assume that they did not turn up for final follow up as they found their vision of satisfactory level for performing their day to day life, vision gain could be an underestimate. In few cases, postoperative vision was noted at the time of discharge or on 1st follow up visit one week after surgery. This could have resulted in underestimates of good visual outcomes as it is known that eye and vision stabilises after six weeks of surgical trauma.[13]

Developing countries where co-morbidities and late presentation for cataract surgery are common, the prevention of blindness program should take preoperative visual status and presence of co-morbidity into consideration while evaluating the outcomes. The proposed audit model of Oman could be adopted for the assessment of visual gain.

Conclusion

In countries like Oman with high prevalence of trachoma, glaucoma and diabetes, the proposed grading of visual gain that accounts for the preoperative vision and the presence of co-morbidity could be better option for auditing the cataract surgery.

Acknowledgments

We thank the administrators of the Ministry of Health to permit us to use the program data on cataract surgery. We also appreciate the efforts of all the ophthalmologists and regional eye health care supervisors in conducting surgical audit. Inputs of Dr Parikshit Gogate to improve the article were useful.

The authors report no conflict of interest and no funding has been received in this work.

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