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ORIGINAL ARTICLE

Use of Cataract Surgery in Urban Beijing: a Post Screening Follow-up of the Elderly with Visual Impairment due to Age-related Cataract

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Objective To understand the perception for the use of cataract surgical services in a population of acceptors and non-acceptors of cataract surgery in urban Beijing.

Methods From a community-based screening program a total of 158 patients with presenting visual acuity of less than 6/18 on either eye due to age-related cataract were informed about the possibility of surgical treatment. These patients were interviewed and re-examined 36 to 46 months after initial screening. The main reasons for not accepting surgery were obtained using a questionnaire. Vision function and vision-related quality of life scores were assessed in those who received and did not receive surgery.

Results At the follow-up examination 116 of the 158 patients were available and 36 (31.0%) had undergone cataract surgery. Cases who chose surgery had higher education level than those who did not seek surgery ($OR=2.64$, 95% CI : 1.08-6.63, $P=0.02$). There were no significant differences in vision function ($P=0.11$) or quality of life scores ($P=0.16$) between the surgery group and the non-surgery group. Main reasons for not having surgery included no perceived need (50.0%), feeling of being "too old" (19.2%), and worry about the quality of surgery (9.6%). Cost was cited by 1 (1.9%) subject as the main reason for not seeking surgery.

Conclusions The data suggest that in China's capital urban center for patients with moderate visual impairment there is a relative low acceptance rate of cataract surgery, mainly due to people's perception of marginal benefits of surgery. Cost is not a determining factor as barrier to undergo surgery and patients with poorer education are less likely to undertake surgery.

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AGE-RELATED cataract is the most common cause of blindness accounting for about 40% of all cases globally.¹ Surgery is currently the only cure for cataract² and considered to be highly cost-effective³ by reducing patients' dependence on their family and society.⁴ Despite the obvious benefits of cataract surgery, the cataract surgical rate (CSR), defined as number of cataract operations performed per million population per year,⁵ and the cataract surgical coverage (CSC), defined as the proportion of people with bilateral cataract who have received cataract surgery in one or both eyes in a given population,⁶ have until recently remained low in many developing countries, including China.⁷⁻⁹ The main reasons for not seeking cataract surgery in rural areas of China and other countries have been well documented including the cost, fear of surgery, female gender and a perception that there is in general no need to undertake the surgery.¹⁰⁻¹⁸ With the rapidly increasing socioeconomic transition, China is becoming a predominantly urban society.¹⁹ Approximately, 50% of the Chinese population are now living in urban centres. The advances in surgical techniques, changing indications and a growing and aging population worldwide have led to a general increase in demand for cataract surgery. A 10-year population based cohort analysis of cataract surgery in Ontario, Canada, found that from the year 1994 to 2005 the number of cataract surgeries performed on persons over 65 years of age more than doubled.²⁰ In urban China although more surgeries are being performed, the increase in the utilization compared to western countries has been modest.²¹ The extent to which cataract remains untreated and reasons of not accepting surgery in urban settings have not been well investigated. To better understand the current situation we studied the use of cataract surgical services among patients with cataract detected from an urban community-based eye disease screening program. The main outcome of interest was the main reason given for not seeking surgery.

SUBJECTS AND METHODS

Population

From July 2007 to January 2009, we conducted a free of

cost eye-disease screening program in the Desheng Community of central Beijing. The community included a population of 109 898, of which 42 537 were aged 50 years or elder. Within a radius of two kilometers of the community there were one specialized eye hospital and five general hospitals with eye departments, all of which offered cataract surgery. Socioeconomic parameters, such as income, education level, occupation and health care facilities were comparable to most areas of urban Beijing.²²

The Ethics Committee of Sekwa Eye Hospital, Beijing, China, and the Ethics Committee for Research in Human Subjects, Prince of Songkla University, Thailand, approved the study protocol, which adhered to the tenets of the Declaration of Helsinki. Informed consent was obtained prior to data collection and eye examination.

Screening parameters

Using advertising posters, residents aged 50 years or elder were invited to participate in the screening program. The screening examination included the examination of presenting visual acuity (PVA), hand-held slit lamp biomicroscopy examination of anterior segment, and fundus photography with non-mydratic fundus camera (Canon CR6-45NM, Japan). PVA was defined as the visual acuity with a logMAR "E" chart using the subjects' best available correction at the presentation to the screening examination. Those subjects with a PVA less than < 6/18 in either eye due to age-related cataract were informed of the availability of cataract surgery.

Follow-up

Between September 2011 and April 2012 (36 to 46 months, 3 years at least, after the initial screening), those who had been referred to undergo cataract surgery at the initial screening were again invited to visit their local health centre at a prearranged schedule. At this visit, examination of visual acuity and anterior segment examination was repeated as in the initial screening. Face to face interviews were conducted. Participants who had not undergone cataract surgery were questioned about the reasons for not seeking surgical services. This was undertaken using a structured questionnaire used in comparable studies modified for our local setting.¹⁰⁻¹⁸ The questionnaire

included 12 questions for why the subject did not choose surgery and an option for "other" explanations. Subjects were asked to choose the most important reason from the 12 listed reasons. A second interview was undertaken using a vision function and vision-related quality of life questionnaire, which was originally developed for a clinical trial of cataract surgery in India²³ and modified to the Chinese context.²⁴

Statistical analysis

All data were entered and validated with EpiData program, version 3.1 (The EpiData Association, Odense, Denmark). The R statistical software package, version 2.11.0, was used for statistical analysis.²⁵ Background characteristics and barriers to cataract surgery were summarized with descriptive statistics. Possible association of use of cataract surgery with vision function and vision-related quality of life was assessed by Wilcoxon rank sum test. Fisher's test was used to investigate the association between receiving surgery and demographic factors. The level of statistical significance was set at 0.05.

RESULTS

Of the 42 537 residents aged 50 years or above in Desheng Community, 4755 (11.2%) attended the eye screening program. Among them, 158 (3.0%) were found to have visual impairment (PVA < 6/18) in at least one eye due to age-related cataract. At the time of follow-up, of these 158 cases, 23 were not traceable and 7 refused to participate. Of the 128 remaining, 10 non-operated cases were excluded because their PVA was better than or equal to 6/18. A further 2 were excluded due to a non-cataract eye disease. Between the remaining 116 study subjects

and the 30 cases that were not available for follow-up, there were no significant differences in respect to sex ($P=0.83$), age ($P=0.16$), and PVA ($P=0.41$) in the initial screening. Of the 116 study subjects, 80 (69.0%) were female, 60 (51.7%) were 80 years or elder and 48 (43.6%) had an education of middle school or above. The mean monthly income per person was 1800 CNY (260 USD), however, 90.3% (102/113) of participants had medical insurance.

Of the 116 study subjects who were followed up 36 to 46 months after the initial screening examination, 36 (31.0%) had accepted surgery. Except for the level of education there were no differences in socioeconomic variables between the two groups. Individuals with higher education level (middle school or above) were more likely to have had surgery than those with lower level of education (primary school or illiterate) ($OR=2.64$, 95% CI : 1.08-6.63, $P=0.02$; Table 1).

There were no significant differences between the operated group and non-operated group for levels of pre-operative visual impairment (PVA<6/18) at the initial screening ($OR=1.42$, 95% CI : 0.60-3.38, $P=0.38$). At the time of follow-up, 10 (28%) cases in the operated group and 23 (29%) in the non-operated group did not accept visual examination. Of those did have vision data, 33 (69%) operated eyes achieved good outcome (PVA $\geq$ 6/18), 88% (23/26) of operated cases had PVA $\geq$ 6/18 of the better eye compared to 39% (22/57) of those non-operated ($P<0.001$). Of those had not accepted surgery at time of follow-up, 56% (32/57) cases had further deterioration of vision since the initial screening. For the worst eye in the non-operated cases (35%, 20/57) had severe visual impairment (PVA<6/60) at follow-up, a doubling since the initial screening (17%, 14/80). (Table 2)

Table 1. Socioeconomic characteristics of the two studied groups [n (%)]

Groups	<i>n</i>	Sex		Age (yrs)		Marital status	
		Male	Female	<80	≥80	Married	Single/divorced/widowed
Non-surgery group	80	26 (32.5)	54 (67.5)	36 (45.0)	44 (55.0)	48 (61.5)	30 (38.5)
Surgery group	36	10 (27.8)	26 (72.2)	20 (55.6)	16 (44.4)	25 (71.4)	10 (28.6)
OR (95% CI)		0.80 (0.30-2.04)		1.52 (0.64-3.65)		1.56 (0.62-4.17)	
<i>P</i> -value		0.67		0.32		0.40	

Groups	<i>n</i>	Education		Occupation		Monthly income (CNY)		Health insurance	
		Middle school	Primary school	Clerical	Manual labor	≥731	<731	No	Yes
Non-surgery group	80	27 (36.0)	48 (64.0)	23 (29.5)	55 (70.5)	43 (79.6)	11 (20.4)	8 (10.3)	70 (89.7)
Surgery group	36	21 (60.0)	14 (40.0)	12 (34.3)	23 (65.7)	17 (77.3)	5 (22.7)	3 (8.6)	32 (91.4)
OR (95% CI)		2.64 (1.08-6.63)		1.25 (0.48-3.14)		0.87 (0.23-3.69)		0.82 (0.13-3.72)	
<i>P</i> -value		0.02		0.67		1.00		1.00	

OR: odds ratio; 95% CI: 95% confidence interval.

Table 3 presents the scores of self-reported vision function and vision-related quality of life in both operated and non-operated cases. There were no significant differences in self-reported vision function ($P=0.11$) or quality of life scores ($P=0.16$) between the two groups.

Out of the 80 studied participants who chose not to seek cataract surgery, 17 would not give any reason for this. The most important reason given by 50.0% (26/52) of

cases was a general self-perception that there was no need to undertake the surgery and 19.2% (10/52) thought they were too old to undergo surgery. About forty-one percent (26/63) worried about quality of the surgical services and 9.6% (5/52) chose it as the most important barrier to cataract surgery. Issues related to access and affordability was generally of less importance (3.8% or 2/52). (Table 4).

Table 2. Distribution of presenting visual acuity at initial screening and follow-up [Number of cases (%)]

Time	Groups	n	Visual acuity of the better eye			Visual acuity of the worse eye		
			$\geq 6/18$	$<6/18$ and $>6/60$	$<6/60$	$\geq 6/18$	$<6/18$ and $>6/60$	$<6/60$
Initial screening	Non-surgery	80	47 (59%)	31 (39%)	2 (2%)	0	66 (83%)	14 (17%)
	Surgery	36	18 (50%)	18 (50%)	0	0	28 (78%)	8 (22%)
Follow-up ^a	Non-surgery	57	22 (39%)	31 (54%)	4 (7%)	0	37 (65%)	20 (35%)
	Surgery	26	23 (88%)	3 (12%)	0	11 (42%)	8 (31%)	7 (27%)

^aA total of 116 cases were included in follow-up study and 33 refused to test visual acuity.

Table 3. Self-reported vision function and vision-related quality of life [median (range)]

Groups	n ^a	Vision function				
		Vision perception	Peripheral vision	Sensory adaptation	Depth perception	All vision function
Non-surgery group	61	83.33 (0, 100)	100.00 (0, 100)	83.33 (16.67, 100)	100.00 (0, 100)	86.67 (10.00, 100)
Surgery group	25	91.67 (33.33, 100)	100.00 (33.33, 100)	91.67 (41.67, 100)	100.00 (0, 100)	93.33 (40.00, 100)
P-value		0.10	0.06	0.21	0.85	0.11

Groups	n ^a	Quality of life				
		Self-care	Mobility	Social	Psychological	All quality of life
Non-surgery group	61	100.00 (83.33, 100)	100.00 (0, 100)	83.33 (0, 100)	100.00 (0, 100)	95.83 (30.56, 100)
Surgery group	25	100.00 (66.67, 100)	100.00 (55.56, 100)	100.00 (0, 100)	100.00 (66.67, 100)	100.00 (63.89, 100)
P-value		1.00	0.11	0.28	0.20	0.16

^a 11 of 36 operated cases and 19 of 80 non-operated cases refused to report vision function and vision-related quality of life.

Table 4. Reasons for not choosing surgery [n (%)]

Reasons	Rated as one of the reasons (n=63 ^a)	Rated as the most important reason (n=52)
Personal reason	55 (87.3)	43 (82.7)
No perceived need	40 (63.5)	26 (50.0)
Too old	35 (55.6)	10 (19.2)
Wait for cataract to mature	5 (7.9)	2 (3.8)
Female	2 (3.2)	0
Believe untreatable	10 (16.1)	0
Quality of surgery	26 (41.3)	5 (9.6)
Socio-economic reason	13 (20.6)	2 (3.8)
Cannot afford the cost of surgery	8 (12.7)	1 (1.9)
Inaccessible of hospital facilities (difficult to register or too long waiting time)	5 (7.9)	0
Lack of escort	2 (3.2)	1 (1.9)
Inconvenient traffic to the hospital	3 (4.8)	0
Contraindication	7 (11.2)	7 (13.5)

^a Out of the 80 studied participants who chose not to seek cataract surgery, 17 would not give any reason for this.

DISCUSSION

In this studied population of persons with moderate vision loss due to age-related cataract, few chose to undergo surgery after a minimum of 36 months of initial examination and diagnosis. There was a general perception that it was no need to undergo surgery as the possible benefits did not weigh up with the perceived risk of complications. The cost of surgery seemed not to be a deciding factor as the majority of the population concerned (90.3%) was covered by medical insurance.

Studies in developing countries conducted almost two decades ago, at a time that access to surgical services for the rural population was relatively new, showed that even when the degree of functional visual impairment was severe there was great skepticism to seek cataract surgical services though these services were relatively affordable and accessible.^{18, 24} Over the years these barriers have undoubtedly been reduced as the realization of the benefits and negligible risks have become more widespread. However, in this recent study from a typical urban setting of a large metropolis where patients presenting with more modest vision loss the use of cataract services seems to be low.

Previous studies have shown that age, gender and level of education are important determinants for seeking cataract surgery, as younger more educated males more readily accept surgery than older less educated females.²⁶ In our study, higher education level was also associated with a higher rate of acceptance of surgery, which was consistent with an Indian study.²⁷ Studies in rural Beijing and Hong Kong conducted about ten years ago, however, did not show this association.^{28, 29}

We did not find important differences between the groups for the scores in vision function or vision-related quality of life. This underlines the importance that these issues should be considered as part of the pre-operative assessment and considerations for recommending surgery.^{30, 31} Forty-one percent of cases questioned the quality of eye care service. The improvement in the quality of surgery will undoubtedly be an overriding important factor that will increase the use of the surgical services.

In summary, our data show that even in the centre of the China's capital city, the acceptance rate of cataract surgery in persons with moderate visual impairment is low. There is still some degree of distrust in the quality of cataract surgery. To gain a better understanding of the real benefits of the current use of surgical services, a larger

study that allow for stratification of severity of vision loss comparing the different socioeconomic strata of the population could be of interest to further clarify these issues.

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REFERENCES

1. Pascolini D, Mariotti SP. Global estimates of visual impairment: 2010. *Br J Ophthalmol* 2012; 96:614-8.
2. Toh T, Morton J, Coxon J, et al. Medical treatment of cataract. *Clin Experiment Ophthalmol* 2007; 35:664-71.
3. Grimes CE, Henry JA, Maraka J, et al. Cost-effectiveness of surgery in low- and middle-income countries: A systematic review. *World J Surg* 2014; 38:252-63.
4. Lansingh VC, Carter MJ, Martens M. Global cost-effectiveness of cataract surgery. *Ophthalmology* 2007; 114:1670-8.
5. Foster A. Vision 2020: The cataract challenge. *Community Eye Health* 2000; 13:17-9.
6. Limburg H, Foster A. Cataract surgical coverage: An indicator to measure the impact of cataract intervention programmes. *Community Eye Health* 1998; 11:3-6.
7. Zhao JL. Prevention of blindness is still an arduous task and embarks on a long road in China. *Zhonghua Yan Ke Za Zhi* 2012; 48:193-5.
8. World Health Organization. Global initiative for the elimination of avoidable blindness: Action plan 2006-2011. Geneva: WHO; 2007.
9. China Disabled Person's Federation. Statistics yearbook on the undertakings of people with disabilities in China. Beijing: China Statistics Press; 2005.
10. Yin Q, Hu A, Liang Y, et al. A two-site, population-based study of barriers to cataract surgery in rural China. *Invest Ophthalmol Vis Sci* 2009; 50:1069-75.
11. Wu M, Yip JL, Kuper H. Rapid assessment of avoidable blindness in Kunming, China. *Ophthalmology* 2008; 115: 969-74.
12. Dhaliwal U, Gupta SK. Barriers to the uptake of cataract surgery in patients presenting to a hospital. *Ind J Ophthalmol* 2007; 55:133-6.
13. Gyasi M, Amoaku W, Asamany D. Barriers to cataract surgical uptake in the Upper East Region of Ghana. *Ghana Med J* 2007; 41:167-70.
14. Jadoon Z, Shah SP, Bourne R, et al. Cataract prevalence,

- cataract surgical coverage and barriers to uptake of cataract surgical services in Pakistan: The Pakistan National Blindness and Visual Impairment Survey. *Br J Ophthalmol* 2007; 91:1269-73.
15. Chandrashekhara TS, Bhat HV, Pai RP, et al. Coverage, utilization and barriers to cataract surgical services in rural South India: Results from a population-based study. *Public Health* 2007; 121:130-6.
 16. Desai N, Copeland RA. Socioeconomic disparities in cataract surgery. *Curr Opin Ophthalmol* 2013; 24:74-8.
 17. Dean WH, Patel D, Sherwin JC, et al. Follow-up survey of cataract surgical coverage and barriers to cataract surgery at Nkhoma, Malawi. *Ophthalmic Epidemiol* 2011; 18:171-8.
 18. Snellingen T, Shrestha BR, Gharti MP, et al. Socio-economic barriers to cataract surgery in Nepal: The South Asian cataract management study. *Br J Ophthalmol* 1998; 82:1424-8.
 19. Zhang KH, Song SF. Rural-urban migration and urbanization in China: Evidence from time-series and cross-section analyses. *Chin Economic Rev* 2003; 14: 386-400.
 20. Hatch WV, Cernat G, Singer S, et al. A 10-year population-based cohort analysis of cataract surgery rates in Ontario. *Can J Ophthalmol* 2007; 42:552-6.
 21. Xu L, Cui T, Zhang S, et al. Prevalence and risk factors of lens opacities in urban and rural Chinese in Beijing. *Ophthalmology* 2006; 113:747-55.
 22. Beijing Municipal Bureau Statistics, Beijing General Team of Investigation under the NBS. Beijing Statistical Yearbook 2008. Beijing: China Statistics Press; 2008.
 23. Fletcher AE, Ellwein LB, Selvaraj S, et al. Measurements of vision function and quality of life in patients with cataracts in southern India. Report of instrument development. *Arch Ophthalmol* 1997; 115:767-74.
 24. Zhao J, Sui R, Jia L, et al. Visual acuity and quality of life outcomes in patients with cataract in Shunyi County, China. *Am J Ophthalmol* 1998; 126:515-23.
 25. R Development Core Team. R: A language and environment for statistical computing. [cited 2013-10-05]. Available from: <http://www.R-project.org>
 26. Li S, Xu J, He M, et al. A survey of blindness and cataract surgery in Doumen County, China. *Ophthalmology* 1999; 106:1602-8.
 27. Murthy GV, Gupta S, Ellwein LB, et al. A population-based eye survey of older adults in a rural district of Rajasthan: I. Central vision impairment, blindness, and cataract surgery. *Ophthalmology* 2001; 108:679-85.
 28. Michon JJ, Lau J, Chan WS, et al. Prevalence of visual impairment, blindness, and cataract surgery in the Hong Kong elderly. *Br J Ophthalmol* 2002; 86:133-9.
 29. Zhao J, Jia L, Sui R, et al. Prevalence of blindness and cataract surgery in Shunyi County, China. *Am J Ophthalmol* 1998; 126:506-14.
 30. Ma QJ, Escobar A, Bilbao A. Explicit criteria for prioritization of cataract surgery. *BMC Health Serv Res* 2006; 6:24.
 31. Quintana JM, Escobar A, Bilbao A, et al. Validity of newly developed appropriateness criteria for cataract surgery. *Ophthalmology* 2009; 116:409-17.