SCIENTIFIC CORRESPONDENCE

A prospective study of the rate of falls before and after cataract surgery

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Background: There has been considerable interest in the development of intervention programmes aimed at reducing the risk of falls. The primary objective was to ascertain whether cataract surgery reduced the risk of falls in elderly patients with age related cataract.
Methods: 97 patients scheduled for cataract surgery were enrolled in this prospective clinical study. The patients were assessed for established risk factors for falls preoperatively and postoperatively. Patients were issued with a diary to record any falls and phoned at 2 monthly intervals during the 6 month preoperative and postoperative periods.
Results: Of the 84 patients who completed the study, 31 recorded falls during the preoperative period (37%). This group showed a statistically significant reduction in the number of fallers in the postoperative period (n = 6, p<0.001)
Conclusion: These results suggest that cataract surgery is an effective intervention to reduce the risk of falls in elderly patients with cataract related visual impairment.

Falls are the most frequent cause of injury related morbidity and mortality among the elderly.[1] Falls are common events for patients over 65 years of age, with 25% falling at least once a year.[2] Eight per cent of people aged 70 years and above seek care in accident and emergency departments for fall related injuries.[3] The case fatality rate for falls in elderly patients is 11.7%.[4] Forty per cent of hospital admissions among people over the age of 65 years are reported to be the result of fall related injuries.[3] Falls are also associated with psychological trauma,[5] loss of independence,[3 6] and reduced mobility and social isolation.[7] In addition to individuals, the cost of falls is also high to healthcare institutions in terms of resources and bed occupancy.[8–10] It is clearly apparent that there is a need to identify patients with modifiable risk factors for further falls.

Visual impairment is common among older people. Visual acuity of less than 6/12 has been found in around 2% of those aged 65–74 and around 20% of those aged 75 and over in community based surveys.[11 12] Falls have been reported in association with visual impairment.[13–15] In the largest community based study of vision and falls, poor visual acuity, reduced contrast sensitivity, and decreased visual field were found to be risk factors for reporting two or more falls in the previous 12 months. In addition, the presence of a posterior subcapsular cataract and use of non-miotic glaucoma medication were also associated with two or more falls.[16]

It has been demonstrated that risk factor modification as part of a multidisciplinary intervention programme can reduce both further falls and subsequent injury.[17 18] Both cataracts and falls are common in the elderly population. In addition, there would appear to be a link between visual impairment and falling; however, to date there have been no studies that have examined whether cataract removal has a beneficial effect on the reduction of falls in the elderly. We conducted a prospective clinical study of the effects of cataract removal on the incidence of falls among elderly people. Our primary objective was to ascertain whether cataract surgery reduced falls in elderly patients with age related cataract.

PATIENTS AND METHODS

Patients were recruited from the ophthalmology department between July 1998 and March 1999. Inclusion criteria consisted of subjects aged 65 years or older with age related cataract of any type, which was visually impairing. The presence of any concurrent ophthalmic disease was established during the ophthalmic assessment and was not an exclusion criteria provided cataract surgery was considered likely to be beneficial. Patients were excluded if they had symptoms compatible with postural hypotension or a drop in systolic blood pressure of greater than 20 mm Hg on standing. Local research ethics committee approval and written informed consent were obtained. Ninety seven subjects were entered into the study. Patients were interviewed at the time of listing for cataract surgery, and asked specific questions about their home environment including factors known to be related to falls at home—for example, bed upstairs, toilet upstairs, working lift, use of appliances, steps, stairs, rugs, frequent bending for wall plugs/fire lighting, type of domicile, and co-resident.[19] Other questions included nocturia, any falls in the preceding year,[20] and their medications.[21] Visual acuity was assessed using a Snellen chart. Each patient was assigned to one of four levels of visual impairment according to the visual acuity in the better eye. A modification of the WHO categories of visual impairment was used, with subdivision of level 1 (adequate vision, more than or = 6/18), into more than or = to 6/9, and 6/12–6/18.[22] The abbreviated mental test score (AMT) and transfer and mobility score were also recorded.[20] Patients were issued with a diary to record any falls, and phoned at 2 monthly intervals over a 6 month period. A fall was defined as a sudden involuntary and unexpected landing on the ground or assumption of the horizontal position, other than as a consequence of sudden onset of paralysis, epileptic seizure, loss of consciousness, excess alcohol intake, or overwhelming external force.

All patients underwent phacoemulsification lens extraction and insertion of an intraocular lens under local anaesthesia. Following cataract surgery patients were evaluated for any change in the potential risk factors listed in Table 2 and issued with a further falls diary. They were phoned at 2 monthly intervals for a further 6 month period. The following information was recorded: number of falls, and if falls had occurred, where, whether a doctor had become involved, A & E attendance, hospital admission, and the nature of any injury sustained.

RESULTS

A total of 97 patients were enrolled in the study. Six were lost to follow up with loss of both preoperative and postoperative

Table 1 Relation between falling preoperatively and postoperatively

	Preoperative faller	
	Yes	No
Postoperative faller		
Yes	6	2
No	25	51

data. A further seven did not undergo cataract extraction because of death or for medical reasons. Of the 84 patients, 31 fell preoperatively (37%). This group comprised 19 females and 12 males. Fifty three patients were non-fallers preoperatively, comprising 35 females and 18 males. Of the 31 preoperative fallers only six (19%) continued to fall after cataract surgery. Of these six patients who continued to fall postoperatively, three had a reduction in the rate of falls and of the remaining three, two had a specific medical complaint that was considered to have contributed to the falls. The specific complaints were an episode of dizziness following oral acetazolamide, and an orthopaedic condition causing instability of the ankle. All six patients had an improvement in visual acuity following cataract surgery. None of the patients had any change in their baseline variables following cataract surgery other than visual acuity and increased age. Eighty eight per cent of both the preoperative fallers and non-fallers obtained a postoperative corrected visual acuity of 6/6–6/9.

The main method of analysis was by cross tabulation using χ^2 or McNemar's test, or logistic regression or *t* test as appropriate. No distinction has been made between first and second cataract operations, because the number of second operations was so small as to have no impact on the outcome.

The primary outcome compares the fall rate in patients during the 6 months before the operation and the 6 months after the operation. This is shown in Table 1, where the appropriate analysis is by McNemar's test for the equality of the off diagonal pairs. For this table χ^2 is 17.9, $p<0.00005$. An index of the possible benefit of the intervention is obtained from the odds ratio: the odds of falling after the operation compared to the odds of falling before. This quantity is 0.08 (95% CI 0.0092 to >0.32), confirming the level of significance from the χ^2 test.

Further statistical analysis of other risk factors using a full matched analysis is impossible because there were only two patients who did not fall before the operation, but did fall afterwards. This is insufficient for analytical purposes. Nevertheless, we tried to identify potential confounding factors by comparing, among those who did not fall postoperatively, those who did and did not fall preoperatively (Table 2).

Those factors emerging as significant in this comparison were age, use of mobility appliances, more than four medications per day, and falls in the preceding year (as distinct from the preceding 6 months). That is, these factors discriminate between those who did and did not fall preoperatively. We then used these variables to predict the likelihood of a postoperative fall. With only eight postoperative fallers in total, no more than two variables can be analysed simultaneously. No combination of variables significantly improves the predictive power of the relation over and above considering variables individually. Neither age nor "more than four medications per day" predict a fall postoperatively. If considered alone a preoperative fall (within 6 months) is still associated with a postoperative fall ($p=0.034$), but the inclusion of "use of a mobility appliance" removes the significant effect of a preoperative fall, leaving the use of an appliance as the sole factor predicting a postoperative fall (odds ratio 8.45, 95% CI 1.57 to >45.06, $p = 0.013$).

Table 2 Postoperative non-fallers (n=76); comparison of risk factor status between the preoperative fallers and the preoperative non-fallers

Characteristic	Preop non-fallers n=51		Preop fallers n=25	
Demography				
Mean (SD) age (years)	79.8	(5.8)	76.4	(4.3)*
Female	34	(67%)	13	(52%)
Domicile				
Own home	45	(88%)	22	(88%)
Warden controlled flat	5	(10%)	1	(4%)
Nursing home	1	(2%)	2	(8%)
Co-resident				
Lives alone	22	(43%)	6	(24%)
Able bodied spouse	22	(43%)	12	(48%)
Not able bodied spouse	2	(4%)	4	(16%)
Other able bodied relative	4	(8%)	1	(4%)
Nursing home	1	(2%)	2	(8%)
Amenities				
Bed upstairs	23	(45%)	16	(64%)
Toilet upstairs	21	(41%)	15	(60%)
Working lift	6	(12%)	4	(16%)
Appliances	7	(14%)	10	(40%)**
Medications				
More than 4 meds	12	(24%)	12	(48%)***
Benzodiazepines	4	(8%)	1	(4%)
Eye drops	8	(16%)	4	(16%)
Falls during preceding year	9	(18%)	12	(48%)****
AMT score (mean)	9.80		9.72	
Mobility score (mean)	5.0		5.0	
Nocturia	28	(55%)	14	(56%)
Environmental risk factors				
Steps	29	(57%)	13	(52%)
Stairs	27	(53%)	17	(68%)
Rugs	15	(29%)	7	(28%)
Frequent bending	19	(37%)	10	(40%)
Ophthalmic examination				
First eye	50	(98%)	24	(96%)
Preop best eye acuity				
≥6/18	41	(80%)	20	(80%)
6/24–3/60	10	(20%)	5	(20%)
>3/60	0		0	

First eye = no previous cataract surgery.
*p=0.012, **p=0.022, ***p=0.058, ****p=0.012, χ^2 used for all.

DISCUSSION

The results of our study demonstrate a significant reduction in the risk of falls after cataract surgery. Preoperative risk factors for a fall, age, and "more than four medications," are no longer predictive of a postoperative fall, and neither is a preoperative fall itself once the use of a mobility appliance is taken into account. These results suggest that elderly patients, those using more than four medications per day, and those who have had a preoperative fall, are most likely to benefit from a cataract operation in terms of reducing the risk of a fall, but that patients using a mobility appliance are still at risk postoperatively.

Falls are common in the elderly population with cataract related visual impairment.[14] The cost of falling is high both to the individual and to health and allied services in terms of resources and bed occupancy. There is a need for strategies to prevent falls in older people. To date there is inadequate evidence for the effectiveness of single intervention such as exercise alone or health education classes.[23] Both improvement in visual acuity and patient's self assessed visual function have been reported as occurring in the vast majority of all cataract operations.[24]

Our results suggest that cataract surgery is an effective intervention to reduce the risk of falls in elderly patients with cataract related visual impairment, particularly if they have a history of a fall in the preceding year, are using appliances, and are taking more than four drugs. Although our study sample

is small the results suggest that there are potential benefits in targeting resources to shorten the waiting time for access to cataract surgery in these patients.

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