Cataracts and Traffic Medicine: A Common Road Safety Issue Which we Fail to See.

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Introduction and Importance

Traffic medicine is a comprehensive, multi-disciplinary speciality which aims to reduce the number of road traffic accidents that imperil human beings’ health and wellbeing. Furthermore there is an enabling and rehabilitative aspect which attempts to ensure that transport is not hampered, or made unsafe, by remediable illness or functional loss (1). Here lies cataract, the most common cause of treatable blindness and visual impairment globally when excluding uncorrected refractive error (2, 3).

Cataracts occur when the ocular lens loses optical clarity, with opacification rendering it unable to perform the function of focusing light onto the retina (4). It is a progressive condition that causes numerous visual impairments that all negatively impact driving which is a multiple component skill (5-8). Risk factors for its development include smoking, alcohol and diabetes mellitus which are not uncommon amongst the Irish population (9, 10). Classification of cataract is extensive; however, with the elderly constituting the fastest growing sector of the driving population (6), it is the age related cataract that poses the greatest risk to road traffic safety. The latest census shows that the population cohort with the largest increase to 637,567 are those greater than 65 years old (11). Population based studies have indicated that 50% of individuals above this age threshold have cataract (12).

The National Treatment Purchase Fund report for November 2018 shows the number of patients waiting for greater than 18 months for an ophthalmology outpatient appointment to be 10,391 (13). This figure has more than doubled since January 2017 when 3,550 patients were waiting greater than 18 months (14). Many of these patients will be awaiting treatment of cataracts and may be driving. Similarly alarming is the Association of Optometrists Ireland’s Children’s Eye Care and Cataract Survey Report 2018 (15). This cites a maximum wait time of 5 years in some parts of the country and an average waiting time of 28 months in the public service between time of referral due to cataract and sight restoring surgery (15). It is bewildering to think that these waiting times are in the context of a cost effective surgery (16), which can take 30 minutes with immediate results (17) and that also improves road safety (6, 18-20). Which begs the question, is cataract one of the most common conditions impeding road safety which we have failed to see?

The Impact of Cataract and Driving

Cataract will lead to a progressive reduction in visual acuity which undoubtedly hampers driving performance (21, 22). However the symptoms of contrast and glare sensitivity present in its earlier stages when visual acuity is preserved (21, 23, 24).

Contrast sensitivity describes the ability to visualise an object from its background. Driving is a skill that demands a high degree of contrast sensitivity in a range of luminance levels (22). Impairment of contrast sensitivity due to cataract has been directly associated with increased crash rates (22, 25). Owsley et al. showed how drivers with cataracts that impaired contrast sensitivity had an increased at-fault crash risk. This was also observed when drivers had only unilateral cataracts and was compared to a control group of drivers free from the condition (25).

Disability glare is a reduction of visual acuity caused by light elsewhere in the field of vision (26), such as an oncoming headlight when driving at night. Increased glare sensitivity can present in mild cataract (24). While it is recognised as impeding driver and pedestrian safety (23, 24, 27) it has not been found to directly cause crash involvement (25, 28). Thus its relevance to road traffic safety is an
important issue that is to be clarified through further studies. This may methodically be a difficult task considering that glare, a multifaceted symptom, is characteristically a subjective experience for the driver.

Hazard perception is “situation awareness for potentially dangerous incidents in the traffic environment” (29). It is the only driving domain that has been consistently related to road traffic accidents (29). Its relevance to cataract was explored through a validated video-based hazard perception driving test. Throughout the intervention, completed from a driver’s perspective, subjects had to identify potential traffic conflicts. Subjects wearing moderate cataract simulated goggles, which conformed to legal visual acuity requirements for driving, were significantly slower than a clear lens control group to identify hazards (30).

**Evidence of Surgical Intervention Importance**

With little proof of the efficacy of medical anti-cataract agents, surgery remains the only definitive treatment (31). This is a cause of concern for road traffic safety in Ireland considering the extensive waiting lists for cataract extraction (15). We should find solace in the fact that convincing evidence exists that reveals the benefits of surgical intervention towards road traffic safety.

A prospective cohort study compared cataract patients who elected to undergo surgery to a control group of those that had no surgical intervention. Patients were followed up for up to 6 years post-operatively and it was found that those who underwent cataract extraction had half the crash rate of those in the control group. A striking finding considering there was no difference between the group’s crash rates in the 5 years preceding the study enrolment (19). The study also elucidates the important issue that even individuals who have a diagnosed untreated cataract still elect to drive. Furthermore, the cataract retaining control group reported their driving difficulty as low and perhaps senselessly, similar to reports of cataract free drivers of the same age (19, 32). This provides an indication of the poor insight that individuals with cataract have towards their condition and the insidious nature of the disease.

More recently, large scale studies have shown the role of cataract surgery in the reduction of road accidents. A population based study of 559,546 patients over the age of 65 who received cataract eye in at least one eye showed a 9% reduction in serious traffic crashes presenting to a hospital emergency department. From 2.36 to 2.14 per 1000 patient-years. Concluding that with 5000 surgeries, 1 serious traffic crash within 1 year could be prevented (20). Reinforcing this Lynn B Meuleners et al. studied drivers who underwent both first and second eye cataract surgery. Each surgery was associated with a substantial percentage (61% first eye and 23% second eye) reduction in the number of crashes per kilometre when comparing one year before and after surgery. The study of 2,849 individuals in Western Australia over the age of 60 also highlights the cost effectiveness of cataract surgery. Estimating a saving of $14.9 million Australian dollars when subtracting the cost of treating cataracts from that of crashes (18), exemplifying cataract surgery as an attractive procedure for the Irish health system and for a country with such an emphasis on excellence in road safety.

The above studies focus on the reduction of serious crash occurrence by cataract surgery (18-20). We must also be cognisant that cataract surgery can benefit road traffic safety at a more modest level. Wood et al. studied the performance of drivers before and after bilateral cataract surgery compared to drivers with normal vision on a closed-road circuit. Outcome measures including hazard perception were examined. Visual assessment measured at each test session included visual acuity, contrast sensitivity, glare sensitivity and kinetic visual fields. This coincidentally is pertinent to the most recent Road Safety Authority (RSA) medical fitness to drive guidelines for complete eyesight testing (1). Driving performance was significantly poorer in the cataract group compared to controls before
surgery. However post-surgical driving performance returned to the level of the controls. The best predictor for an improved driving performance was contrast sensitivity (6), a factor highlighted above to be a risk for traffic accidents (25).

**The Grey Areas**

Presently there lies several grey areas whereby driving with visually significant cataract occurs. These are facilitated by elongated wait times that drivers face while awaiting cataract surgery, the fact that in its mild form cataract can be visually significant in driving, as well as human factors.

Studies show that up to 23% of individuals with cataract drive illegally prior to surgery by having vision below legal visual acuity requirements (33, 34). Recent evidence also shows that in the presence of visually significant cataract, patients awaiting surgery do not self-regulate their driving (35). Although never examined within the Irish population, it is reasonable to suggest that the same may be present at a local level as particularly long waiting lists exist for sight restoring surgery (15), during which vision can decline to below legal standards or to levels which cause serious road safety concern.

The most recently published RSA medical fitness to drive guidelines only depict cataract in its severe form (1) although mild forms of cataract may impair road safety (21, 23, 30). Mild cataract may not be exposed using standard visual assessment protocols. A study using cataract simulation goggles that maintained legal standards in Australia (visual acuity of 6/12 and visual field requirements of 120 degrees in the horizontal meridian) showed that drivers with even mild cataract goggles were a risk to pedestrians. While driving on a closed circuit at night control subjects responded to pedestrians at a distance that was 5.5 times greater than the group wearing the cataract goggles. In the presence of headlight glare, mild cataract subjects were less than half as likely as controls to recognise pedestrians, highlighting again the risks of glare sensitivity symptoms in cataract (23, 24, 27). These findings are significant to the Irish setting considering that pedestrians were the only group to suffer increased fatalities during the year 2018 compared to 2017 (36). Other simulation based studies have shown how mild cataract goggles impaired subjects ability in a hazard detection task (30). The above findings also suggest that the most appropriate time for surgical extraction according to clinical guidelines (37) do not coincide with the optimal time for intervention with regards to road safety.

Alluding again to the RSA medical fitness to drive guidelines, cataract is only recognised in its bilateral form or post-operatively “Cataract includes severe bilateral cataracts, failed bilateral cataract extractions and post cataract surgery where these are affecting the eyesight” (1). Despite the fact that in its unilateral form there lies a significance to road safety. Drivers report difficulty driving with regards to judging the position of a nearside kerb and the position and trajectory of passing cars (38). Unilaterally reduced contrast sensitivity as induced by cataract has also been significantly associated with increased crash risk (25). These omissions from the guidelines provide a false reassurance to drivers that their driving standard is unaffected by unilateral or mild cataract and may also influence the professional assessing fitness to drive.

The current eyesight examination guidelines for driving portray Ireland as a pioneering country in the field of road traffic safety. When there is doubt regarding adequate visual acuity or visual fields, drivers undergo a detailed visual assessment of contrast and glare sensitivity, twilight vision, diplopia and ocular motility amongst other visual functions that may compromise safe driving (1). This may require applicants to submit medical report forms (D501) and the driving licence eyesight report form (D502). The examination is fully comprehensive however is only enforced under certain circumstances (1). This leaves scope for drivers with cataract to avoid such detailed examination as part of the license renewal or application process.
All applicants for a driving licence undergo visual acuity and confrontation visual field examination. However drivers will only be examined by an ophthalmic specialist encompassing the aforementioned complete visual examination when there is suspicion that their vision is inadequate in these areas. This is flawed since visual acuity is a poor measure of loss of visual function in cataract (30). Moreover, as described previously visual acuity can be preserved to legal standards in mild forms of cataract (21, 23, 24, 30). Confrontational visual field testing also pertains limitations and has been exposed as a poor screening test in some studies (39, 40). Examiners should be vigilant of this when assessing drivers with mild cataract.

Of course, if a driver has a visually significant condition that impacts their ability to drive then it must be declared on their medical report form (D501) and subsequently undergo an eyesight examination. Drivers play an important role in filling out the medical report form appropriately and must make their doctor aware of any medical conditions they have that affects driving under the Road Traffic Acts. But as shown earlier, cataract is an insidious condition where drivers have poor insight into its effects on their driving abilities (19). In addition, considering that the majority of Ireland’s rural population may wish to maintain independence through driving, drivers may not see it in their own best interests to declare their cataract(s) as this may jeopardise their future entitlement to drive, especially if they have adapted to driving with their condition.

The Current Picture in Ireland and Future Directions

The 2018 reports from the Association of Optometrists Ireland and National Treatment Purchase Fund shed light on the high volume, prolonged waiting lists for cataract operations (13, 15). Nationwide strategies to reduce these waiting lists have not been deployed however recent pilot schemes and recent developments of infrastructure have been successful.

At an international level, optometrists have been shown to have an important role in reducing the treatment burden of cataract surgery (41, 42). Recently in Ireland too, pilot schemes have introduced these allied health professionals into the cataract surgery care pathway. In Sligo University Hospital a shared care post-operative pathway utilising optometrists was instigated. Optometrists completed a clinical review for patient’s refraction, spectacle requirements and post-operative complications, the latter is usually completed by a hospital doctor. The results showed optometrists could complete the examination safely and efficiently and 100% of the optometrists within the hospital catchment area took part (43). Though no plans have yet been made, when most recently surveyed it was revealed that 97% of optometrists in Ireland are willing to relieve the burden on hospitals and ophthalmology clinics should similar schemes be implemented nationwide. This enthusiasm is highly encouraging going forwards. The Sligo Cataract Scheme is on-going and its value is reflected by the fact that this constituency has the shortest time from referral to surgical treatment in Ireland of 15 months (15).

An interesting finding to note is that the 2018 annual road traffic accident figures by the RSA reveal that Sligo and Leitrim have the lowest number of fatalities from road traffic collisions. While Cork has the highest with 16 fatalities. The most common populations that suffered fatality were those in rural areas and those greater than 66 years of age (36). While these accidents certainly may not all have been involving individuals of this demographic or with cataracts, it seems ironic that the rural West Cork region which could be considered an at risk area for road traffic accidents based on these statistics has the longest waiting list of up to 5 years for cataract treatment (15).

The Royal Victoria Eye and Ear Hospital in Dublin’s ophthalmology strategy has led to the opening of a new standalone cataract theatre in 2017 (44). Resulting in an exponential increase in the number of cataract surgeries and an exemplary reduction in waiting lists. Calls for similar high-volume cataract theatres nationwide are key recommendations from the Irish College of Ophthalmologists. This is in
order to keep wait list times to a minimum and to meet the demands of the increasing incidence of cataract in the population (45).

Such recommendations can only be fulfilled if resources are expanded. However if the demand for cataract surgery is met, which would be in keeping with enabling and rehabilitative aspects of traffic medicine, it is essential that those wishing to drive after cataract surgery are aware of how to do so safely and legally. Moreover the undefined population of individuals in Ireland with cataract that is not yet surgically treated would also benefit from information regarding their medical fitness to drive. Cataract surgery can induce an altered state of vision. Recovery to meet legal standards of driving may be as short as a week with current surgical methods. Despite this, adaptation should extend beyond simply being legally entitled to drive. Drivers should feel comfortable in their functional ability to drive as post-operative symptoms such as dry eye or pain may also hamper abilities (46). Drivers should be aware that if they no longer require glasses or contact lenses post-operatively this necessitates an eyesight examination and a completed Eyesight Report Form (D502) to update or renew their license (1). Post-operative review for complications following cataract surgery usually occur at 4 weeks (43). At this appointment it is pertinent that patients are aware that there is still a possibility of further complications that can affect their driving. An example of such is posterior capsule opacification, the most common complication of cataract surgery (47). Fong et al. revealed it has an incidence of 38.5% and 4.7% for severe cases over a 3 year post-operative period (48). In summary, presently in Ireland there is a paucity of information regarding driving safely and legally for patients with cataracts and post-operative cataract patients which needs addressing.

Conclusion

Cataract has long been recognised and still remains a crucial issue in road traffic safety, yet it appears that we have failed to see it as a priority. Greater recognition of its impact on driving in its earlier stages is warranted as well as the improvement of treatment resources. The fact that surgical treatment is definitive makes cataract unique in that it is a road safety risk that can be eliminated if the demands for treatment are met. Cataract is the most common preventable cause of blindness and visual impairment globally and in this preventative nature lies incentive for its eradication as a risk to road traffic safety in Ireland.
References


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