Timing of Cataract Surgery

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Abstract:  As the population of elderly increases, management of patients with cataract is becoming an issue of increasing importance. Progress in surgical equipment and techniques has increased the safety of cataract surgery, and the insertion of an intraocular lens at the time of surgery has ensured many patients of good postoperative visual function. The mainstay of current cataract treatment is surgery, and it is possible to obtain improved vision if patients and surgical techniques are properly chosen. The timing of surgery is also an important factor. Visual acuity is not an infallible index because it may vary according to the conditions of measurement and the patient's physical and/or mental status. The level of visual acuity required may also vary among different patients according to their lifestyle. Surgery is indicated for patients with nuclear cataract or posterior subcapsular cataract because daylight vision is affected even if the patients have good indoor vision. Surgery should be considered when decreased contrast sensitivity and increasing glare are noted. Since the visual field and fusional amplitude are narrowed when visual acuity is less than 0.5, such changes help in deciding when to perform surgery. The timing of surgery in elderly patients should be determined after consultation with an internist, because cataract patients often have concomitant systemic diseases.

Key words:  Incidence of cataract; Visual acuity; Contrast sensitivity; Visual field; Small-incision cataract surgery

Introduction

Since the number of elderly patients with cataract is increasing as the population ages, the management of vision in cataract patients is an important issue. Because the general public is largely aware of the possibility of cataract, visual impairment in the elderly is likely to lead people to think of cataract as the probable cause. The management of cataract includes preventive measures against development of the condition as well as drug and surgical treatments. When the patient has no significant difficulties in daily living, the main treatment
is medication with anticataract drugs. Surgical treatment is generally indicated as the disease progresses.

Remarkable changes in cataract surgery have taken place in recent years. Large incisions in the surgical procedure have given way to smaller incisions, and surgical extraction has been replaced by ultrasound phaco-emulsification and aspiration as the main technique of lens removal. Even in the postoperative resting phase, absolute bed rest has been replaced with early release from bed rest and a shorter period of rest. Pain from the anesthetic procedure also has been reduced since retrobulbar anesthesia and blink anesthesia were replaced by subconjunctival (in Tenon’s capsule) or eye-drop anesthesia. In addition, safe insertion of intraocular lenses has improved the quality of postoperative vision, in comparison with earlier methods of postoperative vision correction such as eyeglasses or contact lenses. Currently, small-incision cataract surgery plus the insertion of an intraocular lens is the basic surgical treatment for cataract.

The established new surgical techniques and progress in surgical equipment have achieved safer cataract surgery and thus allowed more aggressive application of surgical treatment. However, cataract surgery itself has never been a simple procedure. Although some ophthalmologists note that surgery can be completed within a short period of time, this is not a proper goal for surgery. Errors in patient selection and incomplete adjustment of surgical equipment may cause unexpected complications. In addition, serious intra- or postoperative complications such as endophthalmitis and bullous keratopathy and the postoperative issue of secondary cataract remain to be addressed.

Even if cataract surgery is completed safely and good vision is obtained, visual function with pseudophakia (presence of artificial intraocular lens replacing normal human lens) may present particular problems. The patient may complain of postoperative photophobia, changes in color tone, and impaired stereognosis, none of which were present preoperatively. Therefore, proper selection of amenable patients and proper timing of surgery are important. It is also necessary to obtain informed consent after a full explanation of the surgical procedures and postoperative visual function with pseudophakia has been provided. It is important for the patient to view surgery with an attitude of confidence and to have a clear understanding of what is likely to be involved.

The present communication describes the relationship between disease type and progression of opacities and between patient age and the incidence of cataract, and discusses the proper timing of surgery from the viewpoint of visual acuity and visual function.
Types of Cataracts

Cataracts are generally classified into three main types, cortical, nuclear, and posterior subcapsular, according to the location of lens opacity. Cataract with mixed opacities is referred to as mixed-type cataract. Among these types of cataract, the cortical type (Fig. 1) and nuclear type (Fig 2) are most common, whereas the posterior subcapsular type is less frequent. Mixed-type opacities are frequent in elderly people.

Incidence of Cataract by Age and Sex, and Course of Progression by Disease Type

1. Incidence of cataract (Fig. 3)

The respective incidence rates of age-related cataract including initial opacities are 37–54%, 66–83%, 84–97%, and 100% for those in their 50s, 60s, 70s, and 80s or older. The incidence of cataract in 1993; some kind of opacity was found in 40% of women in their 40s. The incidence of cataract was higher in women than in men in all age groups except those in their 70s. Moderate or more advanced cataract has been reported in 10–13%, 26–33%, 51–66%, and 67–83% of those in their 50s, 60s, 70s, and 80s or older, respectively.

2. Course of cataract progression

There is no evident correlation between age and the rate at which opacities progress. The rate of progression of pre-existing opacities after 5 years is reported to be 16.2% for the cortical type, 50% for the nuclear type, and 55% for the posterior subcapsular type. Although the progression of cortical cataract is slower than that of the other types, posterior subcapsular cataract progresses rapidly once it has developed and may cause markedly decreased daylight vision if opacities reach the pupil area. Early surgery is indicated for patients with this type of cataract even when they have good indoor vision.

After the age of 70 years, cataract surgery is indicated for 30.3% of patients, and the incidence of surgery is significantly higher for females than males.

Mixed-type cataract is frequent among surgical cases, whereas simple cortical or nuclear opacities are infrequent. Cataract surgery of one eye does not cause cataract progression in the other eye.

Indications and Timing of Cataract Surgery

1. Visual acuity

It is difficult to assess visual acuity accurately because a number of factors are involved in the examination of vision: conditions of measurement, the physical and mental status and degree of concentration of the patient, the technical skills of the examiner, and the environment in which the examination is performed. The level of visual acuity considered to hinder
daily living varies among different individuals according to the social lives they lead. Elderly patients with a limited range of activities who usually spend time at home watching TV or reading may not feel inconvenienced at a visual acuity of about 0.5. On the other hand, someone like a taxi driver may have difficulty even at a visual acuity of 0.9. Therefore, it is difficult to determine indications for surgery based on visual acuity alone.

Nevertheless, visual acuity is a necessary general index of the need for surgery. In the author’s opinion, surgery should be indicated for patients with a visual acuity of 0.5 or less. Two decades ago it was common for surgery to be indicated when the patient became “unable to see.” Currently, however, surgery is considered when a patient feels inconvenienced in daily life.

Whether surgery for age-related cataract is performed in a patient with good vision or poor vision has no marked influence on surgical outcome as long as the patient has no other complications. However, patients are discouraged from undergoing surgery if they are not experiencing much inconvenience, because vision in the patient’s own eye (i.e., with a natural lens) is superior in quality to vision in the operated eye (i.e., with an artificial lens). On the other hand, the affected eye may develop glaucoma if left untreated for an extended period. There is also risk of delay in finding lesions, if any, in the ocular fundus.

Patients with cataract may suffer decreased eyesight not only for far distance but also for near distance. A visual acuity of 0.5 or more is required for reading books and newspapers, and surgery is indicated for patients with a higher visual acuity if their occupation requires reading fine print.

2. Types of opacities and visual acuity

As mentioned previously, cortical cataract is slow to progress, and therefore its effects on the patient’s visual acuity tend to be inconspicuous. However, nuclear and posterior subcapsular cataracts, even if mild, affect the patient’s vision; patients suffer evidently decreased visual acuity in daylight even when their indoor visual acuity is 1.2. Such patients are inconvenienced by bright sunlight (hemeralopia) in the daytime and by car headlights at night. Therefore, early surgery is recommended for patients with nuclear or posterior subcapsular cataract even if they have good indoor vision.

3. Contrast sensitivity and visual acuity

Contrast sensitivity to high spatial frequency is decreased. It is important to determine the timing of surgery by measuring contrast sensitivity in patients who have good vision. As cataract progresses, contrast sensitivity decreases significantly. Such decrease obviously will be improved by surgery.

4. Glare

There is no difference in glare sensitivity between patients with mild cataract and those without cataract. That is, problems caused by glare are not significantly greater in patients with early cataract than in those without cataract. However, as opacities progress, visual acuity and contrast sensitivity decrease significantly under conditions of glare. Because it is not certain that there is improvement in glare after cataract surgery, the results of glare testing are of limited value in determining the timing of surgery.

5. Visual field and visual acuity (Table 1)

The visual field reflects the status of the visual pathway from the retina to the visual cortex; the lens is not directly related to it. When measurement conditions such as the size and brightness of targets are varied during measurement of the visual field, the test may show a narrow visual field in patients with cataract because the ability to recognize targets is affected by insufficient illumination.

With a large visual target (4/V isopter) in
Goldman perimetry, the area obtained at a visual acuity of 0.1 was about 80% when the area obtained at a visual acuity of 1.0 was set at 100%. Thus, the decrease was only 20%, which is not especially conspicuous. However, under poorer conditions with a smaller target (2/1 isopter), the area obtained at a visual acuity of 0.3 was markedly decreased to about 10%, demonstrating decreased visual field sensitivity. The worsening of perimetric conditions carries the same meaning as seeing in dim light or attempting to identify a small object. Therefore, reduction of the visual field is regarded as a helpful test result in determining the timing of cataract surgery. Judging from the area measured by Goldman perimetry, a decrease in visual acuity to 0.5 or less indicates the appropriateness of surgery.

6. Fusional amplitude and visual acuity (Table 2)

Fusion enables visual images from both eyes to be recognized as a single image, and the range of vergence for maintaining fusion is called fusional amplitude. Cataract patients appear to have decreased ability for fusion. People with a visual acuity of 1.0 or more have a fusional amplitude of about 30°/°H9004. In contrast, in those with a visual acuity of 0.5 or less, fusional amplitude is reduced by about half. The ability to recognize images deteriorates with decreasing visual acuity. A visual acuity of 0.5 is also considered to be an index of surgery from the viewpoint of the faculty for fusion.

7. General condition (Table 3)

Because elderly patients tend to be involved in cataract surgery, the decision to operate cannot be based solely on the status of the eye. Many cataract patients have abnormalities in their overall condition. When 150 patients

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### Table 1 Visual Field Area in Patients with Cataract

<table>
<thead>
<tr>
<th>Visual acuity</th>
<th>Visual field area (cm²) (4/V isopter)</th>
<th>%</th>
<th>Visual field area (cm²) (2/V isopter)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>190</td>
<td>100.00</td>
<td>22.0</td>
<td>100.00</td>
</tr>
<tr>
<td>0.8–0.9</td>
<td>160</td>
<td>84.21</td>
<td>16.0</td>
<td>72.73</td>
</tr>
<tr>
<td>0.6–0.7</td>
<td>165</td>
<td>86.84</td>
<td>9.0</td>
<td>40.91</td>
</tr>
<tr>
<td>0.4–0.5</td>
<td>190</td>
<td>100.00</td>
<td>7.0</td>
<td>31.82</td>
</tr>
<tr>
<td>0.3</td>
<td>175</td>
<td>92.11</td>
<td>2.5</td>
<td>11.36</td>
</tr>
<tr>
<td>0.2</td>
<td>170</td>
<td>89.47</td>
<td>3.0</td>
<td>13.64</td>
</tr>
<tr>
<td>0.1</td>
<td>150</td>
<td>78.95</td>
<td>3.0</td>
<td>13.64</td>
</tr>
<tr>
<td>0.02</td>
<td>135</td>
<td>71.05</td>
<td>0</td>
<td>0.00</td>
</tr>
</tbody>
</table>

### Table 2 Fusional Amplitude in Patients with Cataract

<table>
<thead>
<tr>
<th>Visual acuity</th>
<th>Fusional amplitude (°)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0–</td>
<td>29±10</td>
<td>100.00</td>
</tr>
<tr>
<td>0.6–0.9</td>
<td>22±8</td>
<td>75.86±3.24</td>
</tr>
<tr>
<td>0.3–0.5</td>
<td>14±10</td>
<td>48.27±13.27</td>
</tr>
</tbody>
</table>

### Table 3 Concomitant Diseases in Inpatients with Age-Related Cataract

<table>
<thead>
<tr>
<th>Disease</th>
<th>No. of cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>51</td>
<td>37.0</td>
</tr>
<tr>
<td>Neuralgia, arthralgia</td>
<td>23</td>
<td>16.7</td>
</tr>
<tr>
<td>Heart disease</td>
<td>20</td>
<td>14.5</td>
</tr>
<tr>
<td>Respiratory disease</td>
<td>15</td>
<td>10.9</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>8</td>
<td>5.8</td>
</tr>
<tr>
<td>Dementia (senility)</td>
<td>3</td>
<td>2.1</td>
</tr>
<tr>
<td>Others</td>
<td>18</td>
<td>13.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>138</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>
admitted under a diagnosis of age-related cata-
ract were examined as to their general condi-
tion, the frequency of concomitant disease was
high, as individual patients tended to have
more than one disease. If the concomitant
disease(s) is in the acute phase, priority should
be given to the treatment of the disease. How-
ever, since the concomitant disease is usually in
the chronic phase, cataract surgery is appli-
cable in many cases. However, it is important to
cooperate with specialists in the relevant fields,
not only to obtain an understanding of the
patient’s general condition, but also to adjust
medications related to surgery, because most
patients are already on drug therapy for the
disease.

Patients with heart disease may suffer ag-
gravation of symptoms as a result of surgical
stress. Therefore, close communication with
the patient’s cardiologist may be necessary.
Hypertensive patients are most frequent. Fortu-
ately, we have not recently encountered
patients whose general condition was aggra-
vated owing to marked variations in blood
pressure. In patients with dementia, a condi-
tion that is likely to increase in the future,
recovery of visual acuity may improve symp-
toms. Surgery for such patients requires the
understanding of the patient’s family. If there is
difficulty in communicating with the patient
because he or she lacks the ability to under-
stand, general anesthesia under the support of
an anesthesiologist should be employed.

Conclusion

Human beings obtain most of our informa-
tion through the visual sense faculty. It is of
great importance to manage visual acuity in
the increasing population of cataract patients,
both to maintain their vitality and that of
society as a whole. The techniques of cataract
surgery have been established, and the inser-
tion of intraocular lenses provides vision of
good quality. However, such vision is inferior
in quality to that provided by a normal, natural
lens. Therefore, surgical treatment is not ben-
eficial unless the patient has been complaining
of poor vision.

On the other hand, the extent of inconven-
ience varies among individuals according to
their visual requirements. Therefore, it is
impossible to determine uniformly the level of
inconvenience at which surgery would be indi-
cated. The fact that about half of patients with
cataract over the age of 70 years have moderate
opacities indicates the presence of a great
number of patients with visual impairment.
The rate of progression and influence on visual
acuity vary according to the type of opacity.
Based on analyses of objective data including
visual acuity, contrast sensitivity, glare, visual
field, and fusional faculty, a visual acuity of 0.5
seems to serve as a yardstick for the application
of surgery.

Although cataract surgery is safer now than
previously, any surgical invasion of the living
body is likely to be associated with complica-
tions. Surgery should be performed after
the patient’s consent has been obtained on
the basis of accurate information regarding
the risks and benefits of surgery, including
the need for surgery, details of the surgical
procedure, and possible complications. Natu-
really, the patient’s willingness to undergo sur-
gery is also important.

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