

# Glare



High beam of head-light of a on-coming car has blinding effect and decreases visibility dangerously. A fielder in the outfield of a cricket match misses a crucial catch because of glare from the flood lights or the sun. Every one knows what is glare and every one has experienced it too, but when asked to describe or define most are confused. Glare can be really troublesome in patients of cataract or after Lasik correction.

## Definition

**Glare can be defined as the contrast lowering effect of stray light in a visual scene.** Glare forms a veil of luminance which reduces the contrast and thus the visibility of a target is decreased. We cannot see intensity differences efficiently in the presence of a high background of light intensity. And the sensitivity to glare is amplified as scattering in cornea or lens increases.

Intraocular Light Scatter in Normal Eyes

Cornea 30 %

Lens 70 %

Aqueous & vitreous < 1 %

## Types of Glare

Glare can be divided into two types:

1. Discomfort glare
2. Disability glare

**Discomfort Glare** refers to the sensation one experiences when the overall illumination is too bright e.g. on a snow field under bright sun.

**Disability Glare** refers to reduced visibility of a target due to the presence of a light source elsewhere in the field. It occurs when light from glare source is scattered by the ocular media. This scattered light forms a veil of luminance which reduces the contrast and thus the visibility of the target.

**Contrast** can be defined as the difference between the luminance of the target and the background relative to the average luminance of the scene.

$$\text{Contrast} = \frac{\text{Target illuminance} - \text{Background illuminance}}{\text{Target illuminance} + \text{Background illuminance}}$$

usually expressed as percentage (%) or as a fraction.

Scattered light raises the luminance of both the target and the background to same extent thereby reducing the contrast.

## Causes of Glare

### I. Discomfort Glare

1. Uveitis
2. Ocular albinism
3. Cone-Rod dystrophy
4. Retinitis pigmentosa

### II. Disability Glare

1. **Old age** - The intraocular scatter of light and glare are fairly constant until about 40 to 45 years of age, after which they increase rapidly. Following are the factors responsible:
  - o lens fluorescence which converts incident ultraviolet light (invisible) into scattered blue light (visible).
  - o yellowing of lens.
  - o senile miosis which reduces target illumination at the retina and adds to scatter from the edge of the pupil.
  - o "subclinical" lens opacities.
2. **Cataract** - Glare sensitivity is markedly increased in cataract compared to normal eye, even when adjusted for age, visual acuity and contrast sensitivity. Glare is related to the degree of diminution of vision in case of nuclear and cortical cataract but not in posterior subcapsular cataract where it is disproportionately higher. Glare increases as the cataract advances and when 80 % of the lens is cataractous the contrast drops and glare increases dramatically.
3. **Posterior Chamber IOL** - Glare sensitivity is higher in eyes with posterior chamber IOL when compared to normal eyes, even when the posterior capsule is absolutely clear.
4. **After Cataract** - Posterior capsule opacification increases glare which is improved by Nd:YAG capsulotomy.
5. **Keratoconus**
6. **Corneal edema** - Epithelial edema leads to more scattering of light and is more visually debilitating than stromal edema.
7. **Radial Keratotomy (RK)** - RK increases glare sensitivity especially under mesopic conditions or when the central optical zone is very small.
8. **Vitreous opacities**
9. **Macular edema** (controversial)

## Measurement of Glare

### I. Discomfort Glare

It can be measured under experimental conditions by having a patient adjust brightness of a light source until it reaches an ill-defined threshold of unpleasantness. However, it does not seem to have any clinical relevance or applicability.

### II. Disability Glare

A conventional visual function test, usually acuity or contrast-sensitivity, is administered in the presence of a glare source. Following tests are available:

1. Miller-Nadler Glare Tester
2. Applegate
3. Eyecon V
4. Contralight Test
5. Brightness Acuity Test (BAT)
6. A simple method which the author uses is to first record the visual acuity of a patient using Snellen's chart and then repeating the same while shining a bright light of an ophthalmoscope or a torch on patient's eye. A drop of visual acuity of two lines or more denotes significant degree of glare.  
Clinical Utility

To measure visual disability in mild cataract especially:  
decreased vision outdoor in bright sun.  
visual disability with night time driving.

To distinguish decreased vision because of anterior segment pathology (media opacity) from retinal pathology. Glare sensitivity is markedly increased in anterior segment disease but is unaffected in retinal disorders. Glare sensitivity tests are more sensitive and more specific for anterior segment pathology.

### Glare Recovery Time

It is a measure of the speed with which the visual system regains function following exposure to bright light. Factors and diseases affecting light and dark adaptation will affect glare recovery. This is used to predict predisposition of a patient to retinopathy.

## Conclusion

To conclude, glare is an important factor in visual disability with anterior segment disease and sensitivity tests are useful in evaluating the visual problems of a patient with early cataract. It also forms a convenient and non-invasive method of differentiating anterior segment pathology from retinal disease. Glare recovery time is useful in predicting the possibility of development of retinopathy in diabetics.