OPHTHALMOLOGIST INTERN

PRACTICUM REPORT

Senile Cataract

1. Introduction

The incidence of senile cataracts has been increasing steadily concomitant with the maturation of the aging population. A survey conducted by the Ministry of Health, Labour and Welfare in 2005, reported 1,290,000 individuals (380,000 men and 91,000 women) afflicted with cataracts, and currently in Japan, 600,000 cataract surgeries are being performed annually. However, by 2020, Japan is projected to have the lowest number of doctors per 1,000 people among all OECD countries as calculated by a professor at Nihon Fukushi University. Hence, although the number of surgeries that one surgeon can perform is increasing due to technological advances, a timely response to the increasing number of cataract patients could be limited by several factors. Consequently, the current therapeutic approaches for cataract should involve determining risk factors to promote primary prevention and decrease the incidence as well as developing non-surgical methods of treatment such as drug therapy. For this purpose, conducting research on the mechanism underlying senile cataracts is also necessary. These topics will be discussed further in this paper.

2. Cataract Risk Factors

The incidence rate of cataracts, including the initial change, is 70% for patients in their 60s, 80% for those in their 70s, and 98% for those in their 80s, which clearly indicates that age is a risk factor for senile cataracts. However, although aging of the lens is observed in the elderly, it is not cloudy enough for it to be considered diseased. Hence, multiple risk factors are thought to be involved in cataract formation. The table below shows the risk factors for cataract other than age. It also includes projections from various reports and problematic aspects such as lack of consistency in diagnostic standards among researchers regarding the initial stages of cataract formation. An epidemiological survey should be conducted using internationally consistent diagnostic standards; such research methodology would help in validating the hypothesized risk factors.

	Effect on cataract incidence	Reports/Research		
		Author	Year	Study region
Gender	More women affected	FES	1977	
Race	More prevalent in Japanese than Indonesians	Sasaki Fujiwara et al	1989 1989	West Sumatra, Indonesia Ishikawa Prefecture, Japan
UV rays	Increase	Zigman	1987	
Decrease/Deficiency in G6PD activity	Increase	Orzalesi	1981	Sardinia District, Mediterranean
Diabetes	3–4 times that of non-diabetics (over 65 years of age)	Hanes	1971–1973	
Anemia	Increase (in males)			
Plasma lipids, urea, bilirubin, creatinine	Elevated levels in cataract patients	Eckerskorn	1987	
Obesity	Increase in incidence rate among those in their 40s and older (no significant difference)			
Malnutrition, deficiency of	Increase	Chatterjee	1982	Punjab District,

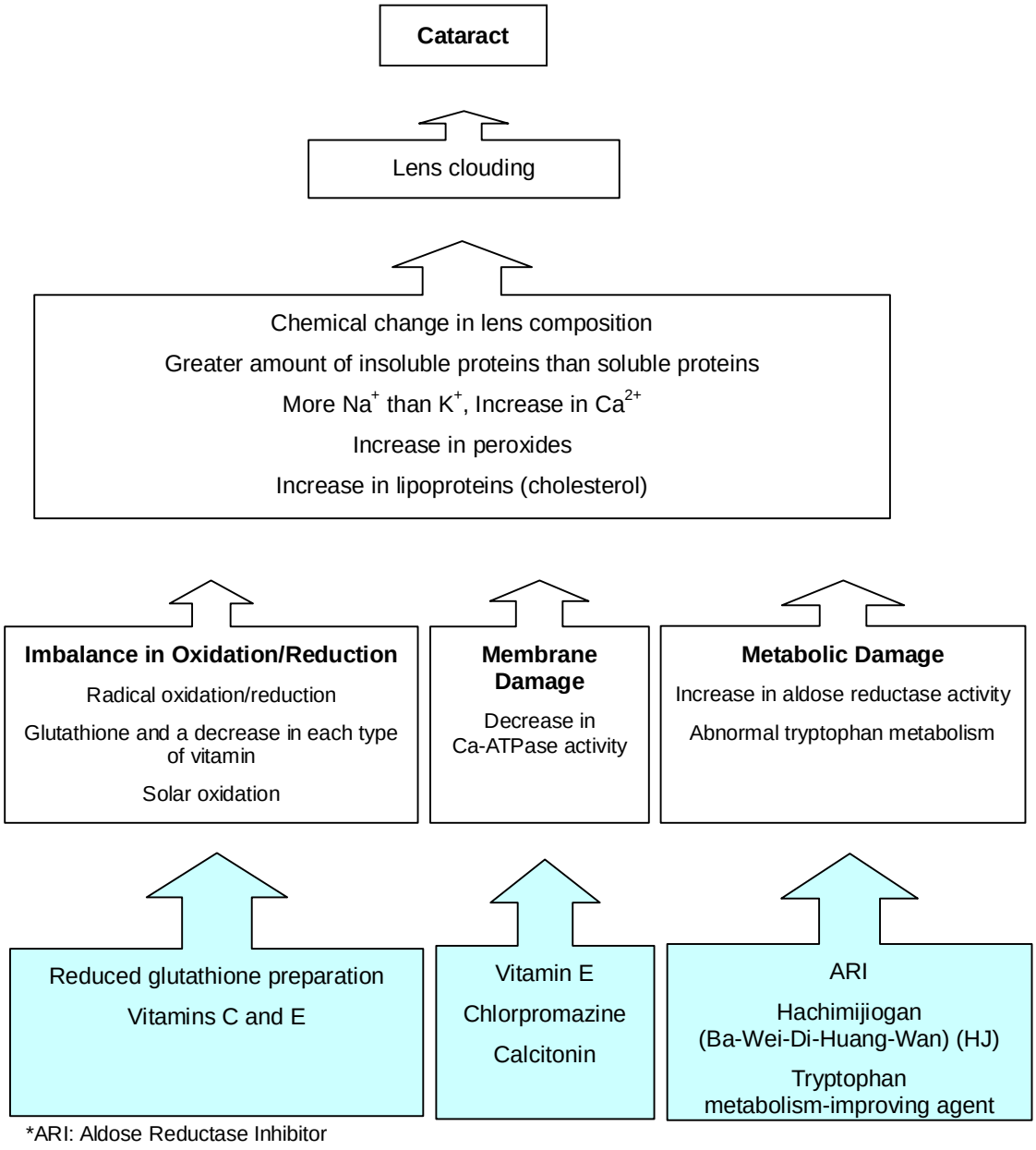
essential amino acids				India
Diarrhea, Dehydration	Increase	Clayton	1984	India
Alcohol, Smoking	No significant difference	Omoda	1988	Japan
Childbirth	No significant difference			
Long-term use of pilocarpine, steroids, chlorpromazine, allopurinol, anticancer antibiotics, 8-MOP	Outbreak, accelerated progress			
Long-term usage of anti-inflammatory pain medication, serious bacterial infection	Deterrent			

*FES: Framingham Eye Study

*HANES: National Health and Nutrition Examination Study

3. Mechanism of Senile Cataract Formation

Cataract formation involves clouding of the eye lens. A causal as well as an initiating factor is thought to be the changes observed when the lens-forming glucose and protein molecules react to produce a large intraocular mass disrupting the lenticular fibers thereby damaging the inorganic ion balance. However, a direct causal link remains unclear. The flowchart below illustrates the mechanism of cataract formation.



*ARI: Aldose Reductase Inhibitor

As shown in the above illustration, the changes in the lens along with those in the surrounding aqueous fluid, vitreous body, and ciliary body contribute to maintaining a compositional balance, which preserves the lens transparency. Moreover, since metabolic changes affect the entire eye, the mechanism of cataract formation is extremely complex.

4. Cataract Drug Therapy

As indicated by the blue boxes in the above flowchart, a wide variety of anti-cataract drugs have been developed that target each stage of the assumed mechanism. Although these drugs have been used clinically, a significantly effective pharmacological agent is yet to be developed. This can be attributed to the complexity of the cataract formation mechanism. In addition, while drug therapy can halt cataract progression, i.e., it can curb the clouding process, it is nevertheless considered more important to administer preventive dosages to maintain transparency and prevent cataract buildup. Therefore, along with pharmacological development, it is necessary to devise effective examination methods to detect early stage cataracts.

5. Summary

In conclusion, apart from determination of conclusive risk factors and mechanism of formation of senile cataracts, several complex unclear aspects need to be ascertained. Accordingly, numerous hurdles in developing preventive measures and drug therapy will have to be overcome, and currently, the only treatment option available is surgery. However, as has already been indicated, considering future medical circumstances, there are limitations to how much surgery as the sole treatment for cataracts can accomplish. Identifying risk factors through large-scale epidemiological research and the subsequent primary prevention and elucidation of the mechanism of formation for the development of drug therapy is anticipated; however, their immediate realization is problematic. Therefore, until these goals are realized, the practical challenge would be to improve the existing surgical methods such as developing newer instruments and to ensure that there are enough ophthalmologists to respond to the increasing number of cataract patients requiring surgeries.