OPHTHALMOLOGIST INTERN

PRACTICUM REPORT

Senile Cataract

1. Introduction

The incidence of senile cataracts is rising steadily as the aging population matures. A survey conducted by the Ministry of Health, Labour and Welfare in 2005, found 1,290,000 individuals (380,000 men and 91,000 women) affected with cataracts, and currently in Japan, there are 600,000 cataract surgeries being performed annually. However, by 2020, Japan is projected to have the lowest number of doctors per 1,000 people among all OECD member 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, there could likely be limitations in responding to the increasing number of cataract patients. Consequently, the current aspects of cataract treatment should involve both determining risk factors to promote primary prevention and decrease the number of patients as well as developing non-surgical methods of treatment such as drug therapy. To this end, studying the mechanism behind senile cataracts is also necessary. A further discussion on these topics will be presented in this paper.

2. Cataract Risk Factors

The incidence rate of cataracts, when the initial changes are included, is 70% for patients in their 60s, 80% for those in their 70s, and 98% for those in their 80s; hence, age is a clear risk factor for senile cataracts. However, even at quite an old age, there are individuals in whom aging of the lens can be seen, but it is not cloudy to the degree that it would be considered diseased. Hence, cataract risk factors are thought to include multiple variables. The table below expresses 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 between researchers regarding the initial stage of cataract. An epidemiological survey should be conducted using internationally consistent diagnostic standards, findings of which would help in determining conclusive 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 Ishikawa Prefecture
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 in essential amino acids	Increase	Chatterjee	1982	Punjab District, India

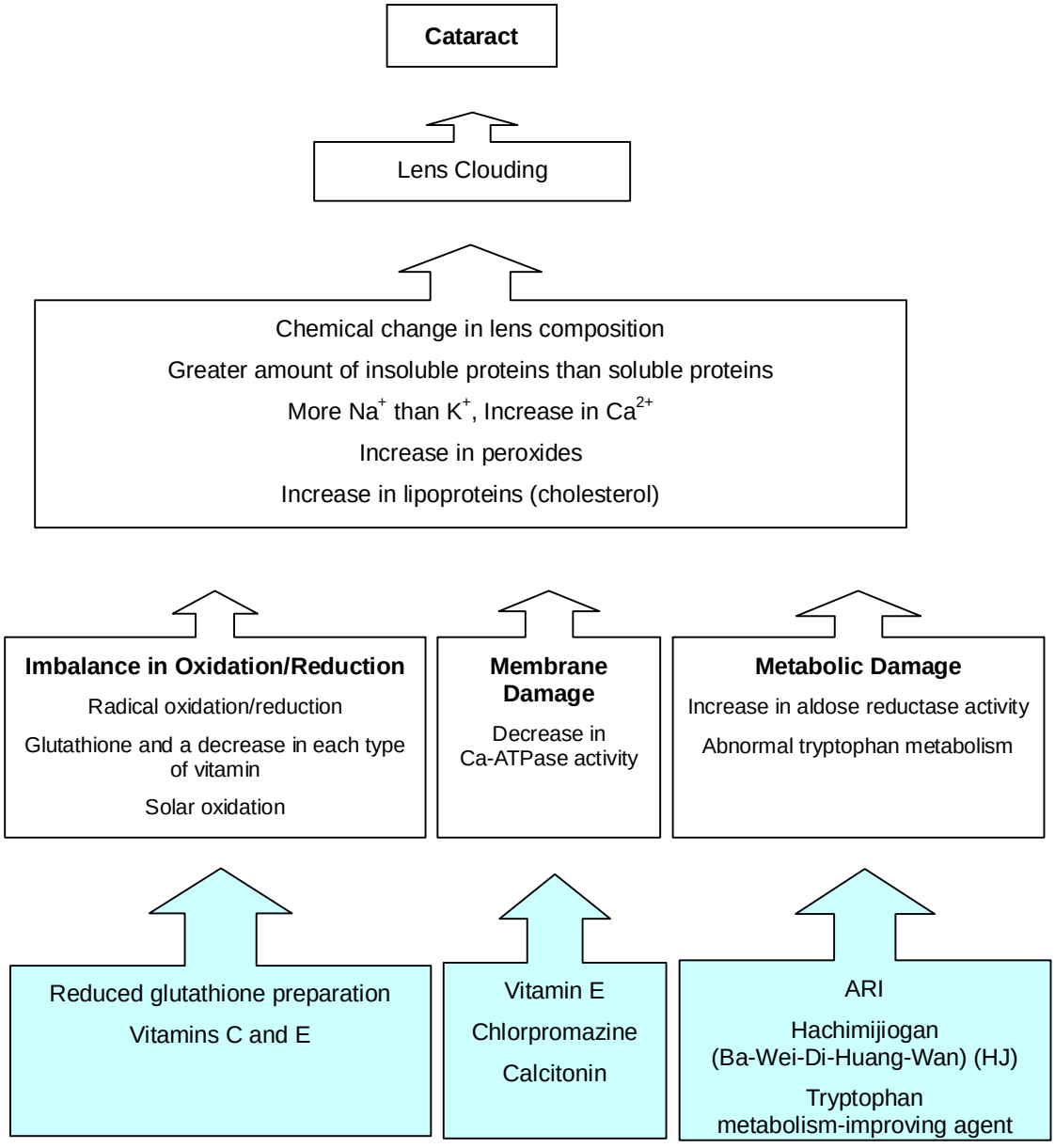
Diarrhea, Dehydration	Increase	Clayton	1984	India
Alcohol, Smoking	No significant difference	Omoda	1988	Japan
Childbirth	No significant difference			
Long-term use of pilocarpine, steroids, chlorpromazine, allopurinol, anticancer antibiotics, 8-MOP	Outbreak, accelerated progress			
Long-term usage of 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 is clouding of the eye's lens. A causal as well as an initiating factor is thought to be the lens changes observed wherein the glucose and proteins react to produce a large molecular mass disturbing the lenticular fibers, thus damaging the inorganic ion balance. However, a direct causal link has not yet been clearly shown. The following diagram illustrates the occurrence mechanism for cataracts.



*ARI: Aldose Reductase Activity Inhibitor

As shown in the above figure, it is not only a change in the lens itself, but also that in the surrounding aqueous fluid, vitreous body, and ciliary body, which contribute to maintaining a compositional balance by which lens transparency is preserved. Moreover, metabolic changes affect the entire organ; hence, the mechanism of cataract occurrence 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, which have been used clinically; however, a significantly effective pharmaceutical has yet to be developed. This is because the cataract occurrence mechanism is extremely complex. In addition, while drug therapy can halt the clouding process of cataract progression, it is considered more important to give preventive dosages to maintain transparency and prevent cataract buildup. Therefore, along with pharmaceutical development, it is necessary to develop examination methods to detect early stage cataracts.

5. Summary

Other than the risk factors and occurrence mechanism of senile cataracts, there are many complex, unclear points. Accordingly, there are many hurdles in the development of preventive measures and drug therapy, and currently, the only treatment option available is surgery. However, as has already been indicated, considering future medical circumstances, there are limits to how much surgery as the sole treatment for cataracts can achieve. Identifying risk factors through large-scale epidemiological research and the subsequent primary prevention and unraveling of the occurrence mechanism to develop drug therapy is anticipated; however, using them may take time. Therefore, until these goals are realized, practical challenges would be to improve surgical methods such as the development of instruments and to ensure that there are enough ophthalmologists to respond to the increasing number of cataract patients and surgeries.