

Original Article

THE HISTOLOGICAL STUDY OF SENILE CATARACTOUS LENSES IN HUMAN

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ABSTRACT

Cataract seems to be an aging process. The aim of this study to find out the various histopathological changes present in senile cataractous lenses in human. The present study was carried out in 200 cataractous lenses. Detailed history, statistical data, morphometric study and histological pictures of selected cases were carried out. These lenses were processed for Haematoxylin & Eosin staining and other types of stains and they showed different histological pictures.

Keywords : human cataractous lenses, senile cataract, visual impairment, lens fibers, morphometry.

INTRODUCTION

Visual impairment is a global public health problem, an estimated 45 million people are blind and in addition 135 million have several visual impairment. The prevalence of blindness in developing countries is 10-40 times higher than in developed countries. The majority of blinds reside in the developing nations of Africa, Asia and Latin America¹. Cataract is a major cause of visual impairment and blindness. It is likely to become an increasing problem as the world population ages². Cataract is clouding of the eye lens that reduces the amount of incoming light and results in deteriorating vision. Blindness thought to be reach 75 million by 2020. Of these, unoperated cataract may be expected to account for at least 35 million. Thus, the burden of cataract is increasing remorselessly (Kavitha et al. 2010)³. It is estimated that there are about 12 million blind people due to cataract in India alone. As the age advances many biochemical changes take place in the ageing lens. Vrensen et al (1990) have observed three age related changes⁴

1. Ruptured membrane,
2. Water vacuoles

3. Multilamellar bodies

Human lens changes its density and thickness correlating with aging.⁵ The degenerative process of lens fibers in a cataractous lens is described as biochemical changes of a part of lens protein.⁶

For clinical ophthalmologists it would be interesting to learn, what histological changes correspond to clinical features of cataract they find in various cataractous eyes in daily practice.⁷ The frequency of these alteration increases with age. TEM studies showed that the cytoplasm of some cataractous lenses appeared more granular in texture.⁸ Shaikh and Janjua (1997) had done morphological and morphometrical study of human lens in senile cataract.⁹ Histological changes were studied in senile cataractous lenses removed surgically from patients aged 50 to 78 years, 68% had nuclear sclerosis, 44% swollen cells, morgagnian globular changes in 23%, calcium deposition in 15% and migration of epithelial cells beneath posterior capsule and villous projection in posterior in 7%.

The aim of this study was to assess the clinical findings and corresponding histological features of cataract.

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MATERIAL AND METHODS

The present study was carried out in association with department of Ophthalmology in 200 cataractous lenses. A detailed history and examination of patient admitted for cataract operation was done. Data was stastically analyzed for incidence of age, sex distribution and etiological factors associated with cataract. After taking history the morphometry of lens was done by help of ultrasonography, Catatractous lens was obtained at time of operation. The lens was washed with normal saline and the lens was divided into 2 parts. Half was preserved in bovine fluid and half was preserved in Mcmannousfluid. The lens was processed for the paraffin wax section and stained with following stained.

1. Haematoxylin & Eosin – for general Histological changes
2. Masson’s Trichome- for collagen
3. PAS Staining- for glycogen
4. Sudan black B-for lipids

The observation of slides was done under microscope and after that photography of slides was done on Kodak Gold color film,100ASA,21DIN by automatic ORTHOMAT camera fitted in ORTHOPLAN.

OBSERVATIONS

The present study has been done in 200 cataractous lenses obtained from ophthalmology department.

TABLE -1

Distribution of patients on the basis of Gender		
Sex	No of patients	Percentage
Male	124	62
Female	76	38
Total	200	100

TABLE -2

Distribution of patients on the basis of Age		
Age Group	No of patients	Percentage
30-40	10	5
40-50	20	10
50-60	60	30
60-70	84	42
and 70 +	26	13
Total	200	100

Physical Examination of eyes of patients

TABLE -3

Colour of pupil	No of patients	Percentage
Pearly white reflex	128	64
Greyish white reflex	72	36
Total	200	100

Cataract associated with specific disease

Table -4

Cataract associated with specific disease	No of patients	Percentage
Diabetes	28	14
Glaucoma	20	10
Hypertension	54	27
Trauma	12	6
Congenital	8	4
Other disease	18	9
Total	200	100

To 60 cases no.specific cause could be associated therefore these 60 (30%) cases were supposed to be senile cataract.

Table -5

Region of Lens	No of patients	Percentage
subcapsular region	40	20
Cortical	82	41
Junction of cortex and nucleus	32	16
Nuclear region	46	23
Total	200	100

All the slides were examined under low and high power of microscope.

Histological examination of cataractous lens should changes in all the regions of lens that is lens capsule, cortex and nucleus.

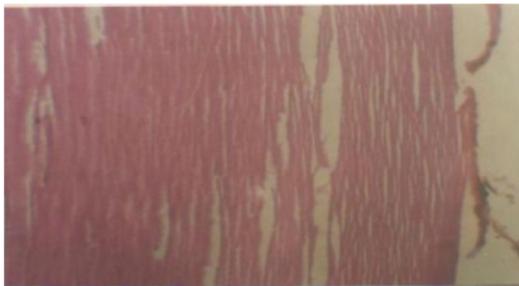


Fig. 1 : Photomicrograph of cataractous lens showing ruptured capsule. Lens fibers in deeper layer showing fragmentation in some areas, spaces between lens fibers is increased. (Haematoxylin & Eosin Staining X 100)



Fig. 2 : Photomicrograph of cortical region of Cataractous lens showing ruptured, capsule, increase interdigitation of lens fibers and increased spaces between lens fibers. (Haematoxylin& Eosin staining X 400)

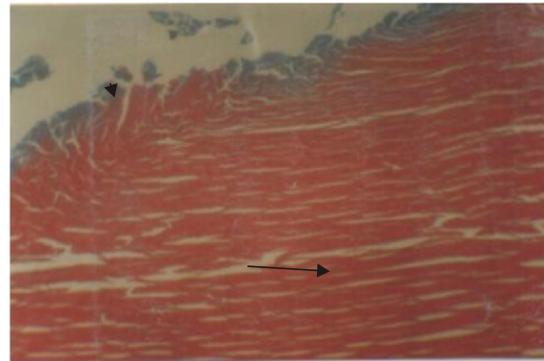


Fig. 3 : Photomicrograph of cataractous lens of subcapsular area showing marked degenerative changes. Capsule is intact. Excrescence on lens capsules are seen. The lens fibers have markedly fragmented and lost their cell markings. Cortical architecture is markedly distorted. (Haematoxylin& Eosin staining X 400)



Fig. 4 : Photomicrograph of cataractous lens showing breaking of lens capsule. Lens fiber showing marked degeneration and fragmentation. Cytoplasm is full of glycogen granules. (PAS staining X 400)



Fig. 5 : Photomicrograph of cataractous lens showing marked degeneration and fragmentation in subcapsular region. At many places large vacoules are found. (Haematoxylin& Eosin staining X 400)

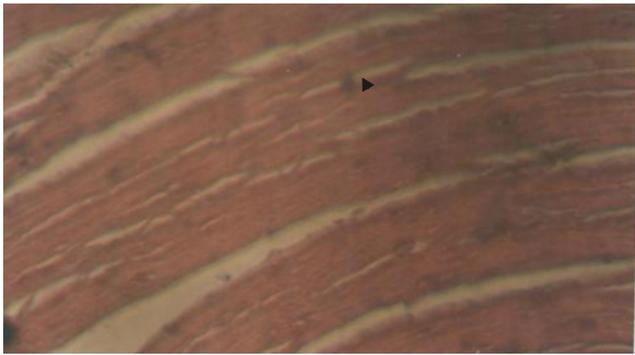


Fig. 6 : Photomicrograph of cortical region of cataractous lens shows lens fibers are widely separated in cortical region. Plasma membrane is showing lipid deposit. (Sudan Black B staining X 400)

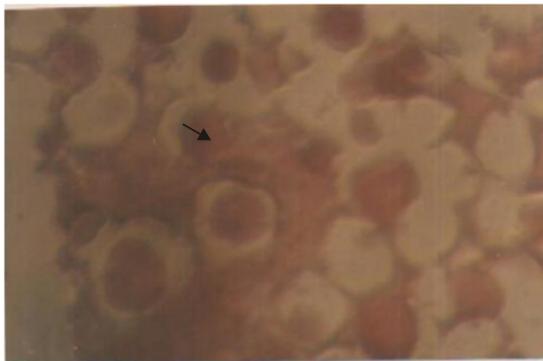


Fig. 7 : Photomicrograph of nuclear region of cataractous lens showing deposition of lipid granules in cytoplasm of nuclear region. Formation of morgagnian globules are also seen. (Sudan Black B staining X 400)

DISCUSSION

Between 45-65% of blindness worldwide is attributable to cataract and subsequent blindness, cataract is the opacification of crystalline lens which may result in the visual impairment. In the present study 62% cases were male while 38% cases belong to female. (Guggenmos et.al. 1989) 10 have shown that lenses of male and female differ. The epithelial cell density is higher in female (5780.6 cells/ cumm) than in males (5008.6 cells/cumm). Although the causes of senile cataract are poorly understood, much of the biochemical data obtained from human blood or the lens give rise to the hypothesis that the development of senile cataract is highly complex and depends upon numerous factors such as genetic makeup, gender, diabetes, geographical location, exposure to UV light, level of education, occupational status and finally, the role of nutritional factors in the daily diet (Heiba et al 1995;11 Pierscionek BK and

Weale RA ; 1996;12 Leske et al 1997)13). In the present study maximum number of 42% cases belonged to age group 60-70 yrs. Of these cataractous cases 14% were having diabetes mellitus, 10% glaucoma, 27% hypertension, 6% trauma, 4% congenital and 9% other disease. In 30% cases no specific causative factor could be co-related and so these cases were said to be senile cataract.

In human cataracts there is abnormal permeability of the membranes of lens fibers. This is reflected by the hydropic degeneration of the lens, disrupted cell membranes and enlargement of the space between the lens fibers (optically empty spaces in the lens cortex (water clefts)) (Klintworth and Garner, 1994)14. An increase in interdigitations between adjacent fibers of lens cortex has been observed in the ageing lens and human senile cataracts {Kobayashi and Suzuki (1975)15, Philipson (1973)16}. In the present study histological examination of cataractous lenses revealed that in many cases lens capsules was ruptured (Fig-1) spaces between lens fibers increases in some area (Fig-2). Excrescences on intact lens capsule were also seen (Fig-3,4). The lens fibers were showing fragmentation, the cytoplasm is full of glycogen granules (Fig-5).Some places large vacuoles were formed (Fig-6). Sudan black B Staining showed deposition of lipids in cell membrane of lens fibers (Fig-5,6). In nuclear region of cataractous lens showing deposition of lipid granules in cytoplasm of nuclear region. Formation of morgagnian globules are also seen (Fig-7)

CONCLUSION

From the above study it was concluded that cataract occur at all ages but most common age group 60-70 years. Cataract is associated with many disease in which 14% cataractous cases having diabetes mellitus, 10% having glaucoma, 27% hypertension, 6% trauma, 4% congenital and 9% other disease, 30% cases were excluded as senile.

Degenerative changes were found patchy and of varying degree starting from increase in sublamellar spaces, swelling of lens fibers fragmentation of lens fibers, loss of architecture patchy homogenous areas.

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