Prevalence of the different types of age-related cataract in Upper Egypt

Thesis

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بسم الله الرحمن الرحيم

وقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ عَمَلَكُمْ
ورَسُولُهُ والْمُؤْمِنُونَ

صدق الله العظيم

سورة التوبة آية (105)

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Mai Mahmoud Mohammed

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List of Abbreviations

(AGE)	Advanced glycationendproducts
(AR)	Age related
(CBD)	Cholesterol bilayer domain
(CT)	Computed tomography
(CC)	Cortical cataract
(DHA)	Dehydroascorbic acid
(GPx)	Glutathione peroxidase
(GR)	Glutathione reductase
(GST)	Glutathione S-transferase
(HO•)	Hydroxyl radical
(IOP)	Intraocular pressure
(LOOH)	Lipid hydroperoxides
(LPO)	Lipid peroxidation
(LOO•)	Lipoperoxyl radical
(MRI)	Magnetic resonance imaging
(MsrA)	Methionine sulfoxidereductase A
(NS)	Nuclear Scleorosis
(GSSG)	Oxidized glutathione
(PI-3K)	Phosphatidylinositol-3kinase
(PSC)	Posterior sub capsular
(PMSO)	Protein methionine sulfoxide
(ROS)	Reactive oxygen species
(GSH)	Reduced glutathione
(RAPD)	Relative afferent pupillary defect
(WIS)	Water insoluble protein
(WS)	Water soluble protein

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Introduction

A cataractis any opacity of the natural crystalline lens that degrades the optical quality (Machan et al., 2012) that affects vision, working and living comfort (Bojana et al., 2009).Cataract is a multifactorial disease (Gilliland et al., 2008).But age has been established as a major risk factor for cataract formation (xing et al., 2010).So age-related cataract is a major cause of blindness worldwide (chiu et al., 2007, Julie et al., 2010, Jun Get al 2009), which increase in prevalence with age (Julie et l 2010) with an estimated 17 million individuals bilaterally blind (Nathan et al., 2001)

Age-related cataract, whichcover more lens areas are considered more severe and correlated with increased visual impairment (Alison et al., 2010). However age related cataract is a non preventable disease of aging (Cook et al., 1995), the effect of age can be expected to grow and will increase dramatically in the coming decade (James et al., 2004). Only age-related (AR) cataracts contribute significantly to these public health concerns, because congenital and other types are rare in comparison (Machan et al., 2012).

Age related (AR) lens changes are typically described as three distinct morphological entities: nuclear sclerosis (NS), cortical cataracts (CC), and posterior subcapsular cataracts (PSC) (Machan et al., 2012) .

Age adjusted incidence of all cataract types increased with increasing age, although the age effect was not linear for all three types (Barbara et al., 2008).

The lens is a key refractive element of the eye (Micae et al., 2011) by the design of its transparency (Trscotte et al., 2009).The primary function of the eye lens is to focus light on the retina (Trscotte et al., 2009, Xinget al., 2010) producing clear, sharp images (www.thenakedscientists.com).

Population based study of lens opacity have suggested that the distribution of lens opacity typesdiffer between races (Nathan et al., 2001).

cataract can be treated most often with excellent outcomes (BREFSS, 2008) through surgery with IOL implantation (Ava2006).

The World Health Organization identifies cataract as the cause of 50% of world blindness (Machan et al., 2012).

In Canada, the prevalence of age-related cataract was 35.5% in 2012 (Machan et al., 2012), in India, prevalence of cataract in people aged was < 85% in North India and 53% in South India in 2011 (Praveen et al., 2011) and in SouthAfrica population, prevalence ranging from 87.5% for individuals aged 80 years and older to 91.1% for those in their 50s in 2001 (Nathan et al., 2001).When Lens transparency decreased with age (Sasaki et al.,

2004, Xing et al., 2011).The term ageing implies cellular changes that accumulate with time and ultimately lead to functional impairment. Ageing is not a homogeneous process in the individual (Micael et al., 2011). There is a continuous increase in lens stiffness with age (Glasser et al., 2008, Micael,2011) increase intraocular scatter, thereby reducing retinal image contrast (Javad et al., 2011).Age is by far the biggest risk factor for cataract, and it is sometimes assumed that cataract is simply an amplification of this aging process (Truscotte et al., 2005) even under intact physical conditions, so it's name age-related cataract (Xing et al., 2011).So the link between older age and cataract has been well reported andolder age at baseline was found to be a risk factor for the development of nuclear, cortical, and mixed lens opacities (Grace et al., 2012). There forCataracts are very common in older people (www.nei.nih.gov).

In senile cataract that manifested in the later years of life, the oxidation changes of lens structures during the development of cataract increase (Bojana et al., 2012).

Lens Anatomy

Gross anatomy:

The human ocular lens is a transparent biconvex structure located behind the iris and pupil 'anterior to the lenticular fossa '. It is in the visual axis of the eye between anterior aquoushumour and posterior viteroushumour (Purshottam et al., 2004).

Refractive index of cortex is 1.386 while refractive index of nucleus is 1.406.

The diameter of the lens is 9-10 mm. Its axial diameter varies markedly with accommodation. By direct measurement it is about 3·5 to 4·0 mm at birth, about 4 mm at 50 years, increasing slowly to 4·75 to 5·0 mm in extreme old age. In contrast its equatorial diameter, 6·5 mm at birth, is 9-10 mm in the second decade and changes little thereafter.

Like all lenses, that of the eye presents for examination two surfaces, anterior and posterior, and a border where these surfaces meet, known as the equator (equator lentis).

The anterior surface, less convex than the posterior, is the segment of a sphere whose radius averages 10 mm.

It is in relation in front, through thepupil, with the anterior chamber of the eye, with the' posterior surface of the

iris, the pupillary margin of which rests on the anterior surface; with the posterior chamber of the eye, and with the ciliary processes. (figure 1)

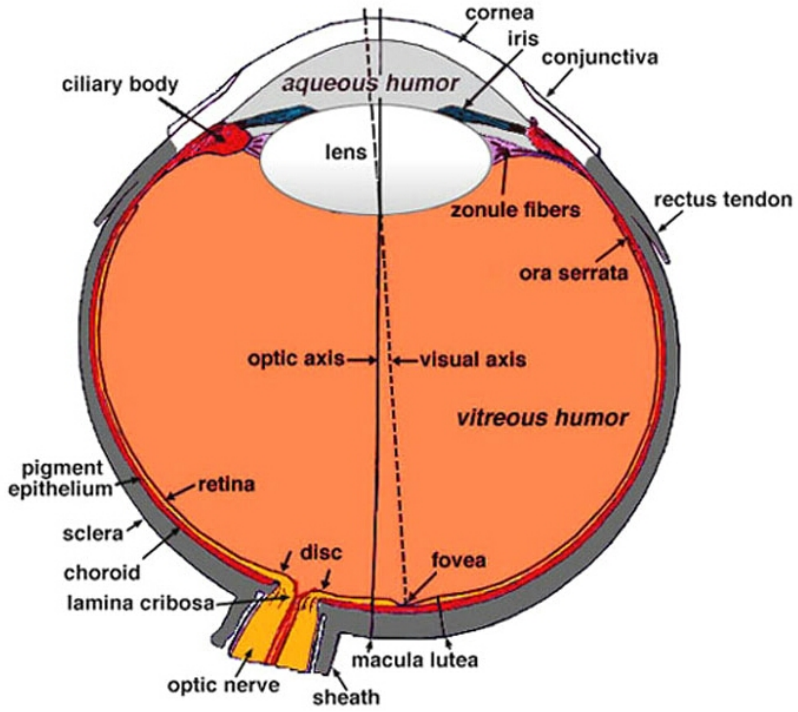

Figure (1) :sagital horizontal section of the adult human eye
Reference:www.webvision.med.utah.edu

The centre of the anterior surface is known as the anterior *pole,* and is about 3 mm from the back of the cornea.

The posterior surface, more curved than the anterior, presents a radius of about 6 mm (4·5 to 7·5 mm). It is usually described as lying in a fossa lined by the hyaloid membrane on the front of the vitreous, but it is separated from the vitreous by a slight space filled with primary

vitreous.

The Equator of the lens forms a circle lying 0·5 mm within the ciliary processes.

The equator is not smooth, but shows a number of dentationa corresponding to the zonularfibres. These tend to disappear during accommodation when the zonularfibres are loose.

The refractive index of the lens (1·39) is only slightly more than that of the aqueous and vitreous humours (1·33), and hence, despite its smaller radii of curvature, it exerts much less dioptric effect than the cornea. The dioptric contribution of the lens is about 15 out of a total of about 60 diopters for the normal eye. At the time of birth the accommodative power is 15 to 16, diopters, diminishing to half of this at about 25 years and to 1 to 2 diopters at 50 (Wolff, 1976).

Microscopic anatomy:

Capsule:

An elastic capsule surrounds the lens and maintain its structural integrity.The capsule is 2 to 20 mm thick (thinnest at the poles and the equator), (figure2).The capsule is made up of collagen like glycoprotein material and digested collagenase. The

lens capsule depends on contact with lens epithelium and fiber for metabolicsupply (ADLER, 1987).

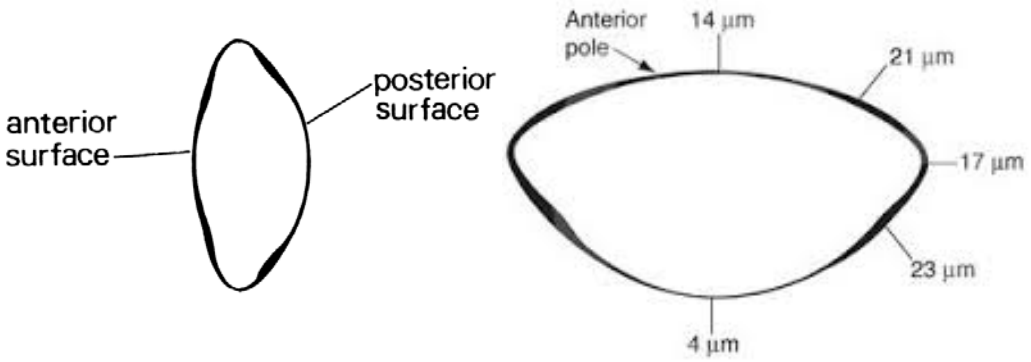

Figure (2) :anterior and posterior surface of the lensReference:www.one.aao.org

Epithelium:

The cuboidal cells of the lens epithelium form amonolayer.The epithelial cells is firmly attached to theanterior capsule and loosely attached to the underlying fibers. Cells are densely packed in the equatorial and preequatorialregions(ADLER 1987). In the equatorial region, the lens epithelial cells differentiate to form lens fibers (Purshottam et al., 2004), (figure 3).