East African Scholars Journal of Medicine and Surgery
Abbreviated Key Title: EAS J Med Surg
ISSN: 2663-1857 (Print) & ISSN: 2663-7332 (Online)
Published By East African Scholars Publisher, Kenya

OPEN ACCESS

Volume-3 | Issue-11 | Nov-2021 | DOI: 10.36349/easjms.2021.v03i11.006

Review Article

Cataracts: An Overview

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Article History
Received: 04.10.2021
Accepted: 08.11.2021
Published: 11.11.2021

Journal homepage:
https://www.easpublisher.com

Quick Response Code

Abstract: Cataracts are a common eye disease and one of the leading causes of blindness worldwide. In patients with cataracts, the eye lens hardens and becomes cloudy, which results in vision deteriorates over time, making it difficult for the patient to carry out routine activities. There are many factors for the occurrence of the disease, the most common factor is aging. There is no treatment to prevent or stop the progression of cataract; however, the only treatment is to undergo surgery, where original lens is replaced by a new artificial lens, that can enable the patient to see clearly.

Keywords: Cataract; eye disorders; cataract extraction; phacoemulsification; eye cataract; nuclear cataract; PSC cataract; cortical cataract; blurred vision; cloudy eye; blindness.

Cataracts: An Overview

It is believed that vision is the most important sense for humans. Almost 50% of the body sensory receptors are found in the eyes, which are considered among the top complex organs [1, 2]. The main parts of the human eye (as indicated in figure 1) include the iris which is the colored part of the eye, a clear dome-shaped tissue called the cornea, the lens that is a capsule filled with water and fibers, and a light-sensitive layer of tissue lines the back of the eyeball called the retina. These parts work coordinately together in a complex process that begins when the light passes through the cornea; the iris allows some of these light beams to get into an opening called the pupil then through the lens that focuses light correctly on the retina. Once the light hits the retina, photoreceptor cells turn it into electrical signals that travel through the optic nerve to the brain which generates the images we see [1, 3, 4, 5].

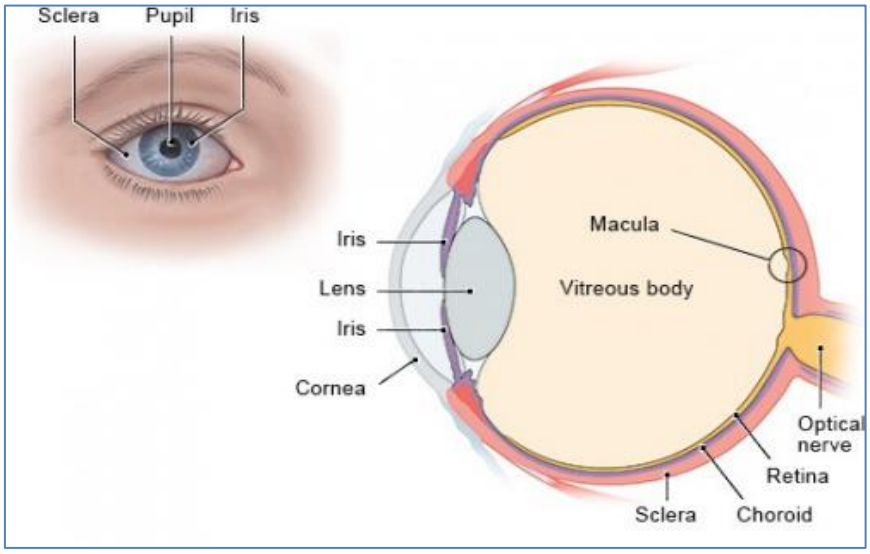

Fig-1: The main parts of the human eye [5].

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Unfortunately, lens elasticity decreases drastically with age; typically, in individuals older than 40 years. The lens gets hardened, clouded, and unable to focus light properly; resulting in a condition known as cataract [1, 6, 7].

Cataract is the main cause of blindness around the world; it is a gradually progressive and painless eye disorder that affects infants, adults, and most commonly elderly people. Recent studies reveal that cataract is more prevalent in women, with a male to female ratio of about 1 to 1.3. Some of the symptoms of cataracts include blurred vision, faded colors, multiple images, and poor night vision, among others [1, 4, 7].

The healthy eye lens is transparent, composed of fibers, and enclosed in a membranous structure known as the capsule. Lens matter consists of two main parts: the Cortex and the Nucleus (Figure 2) [7]. In cataract eye, the clear lens or its capsule is clouded or opacified which prevent the passage of light through the lens to the retina [5].

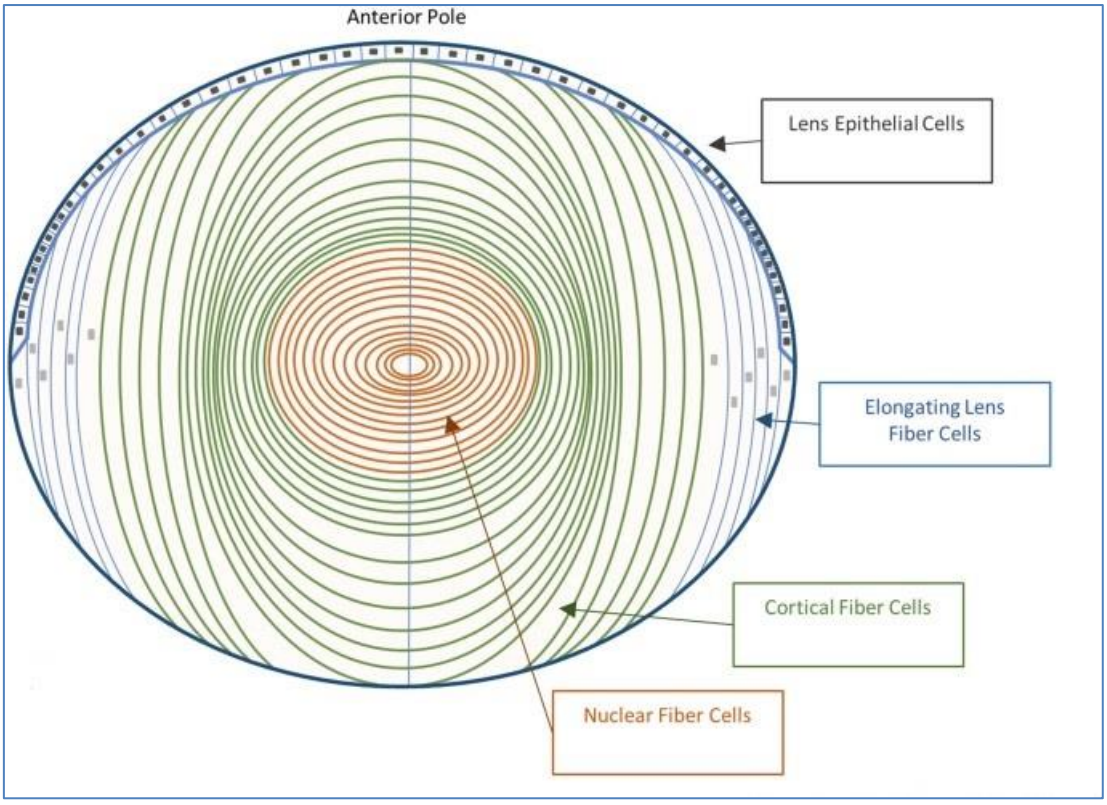

Fig-2: Schematic representation of the eye lens [8]

The main proteins that make up the lens and its surfaces are called crystallins; any modification, aggregation, or precipitation of these proteins results in losing the lens transparency, therefore, cataract development [4, 6, 7].

The major factors that are responsible of cataract incidence include aging, which introduces the most common type of cataract (senile), and congenital. Moreover, traumatic injury and some diseases that contributes in cataract development [7].

Morphologically cataract is classified to three groups (Figure 3); *nuclear* cataract, which is the most common that begins with a gradual whitening of the lens central area that expands with time. *Cortical* cataract begins in the edges of the lens and gradually moves inward in a spoke-like pattern. *Subcapsular PSC* is an asymmetric granular opacity at the back of the lens that develops rapidly [4, 6].

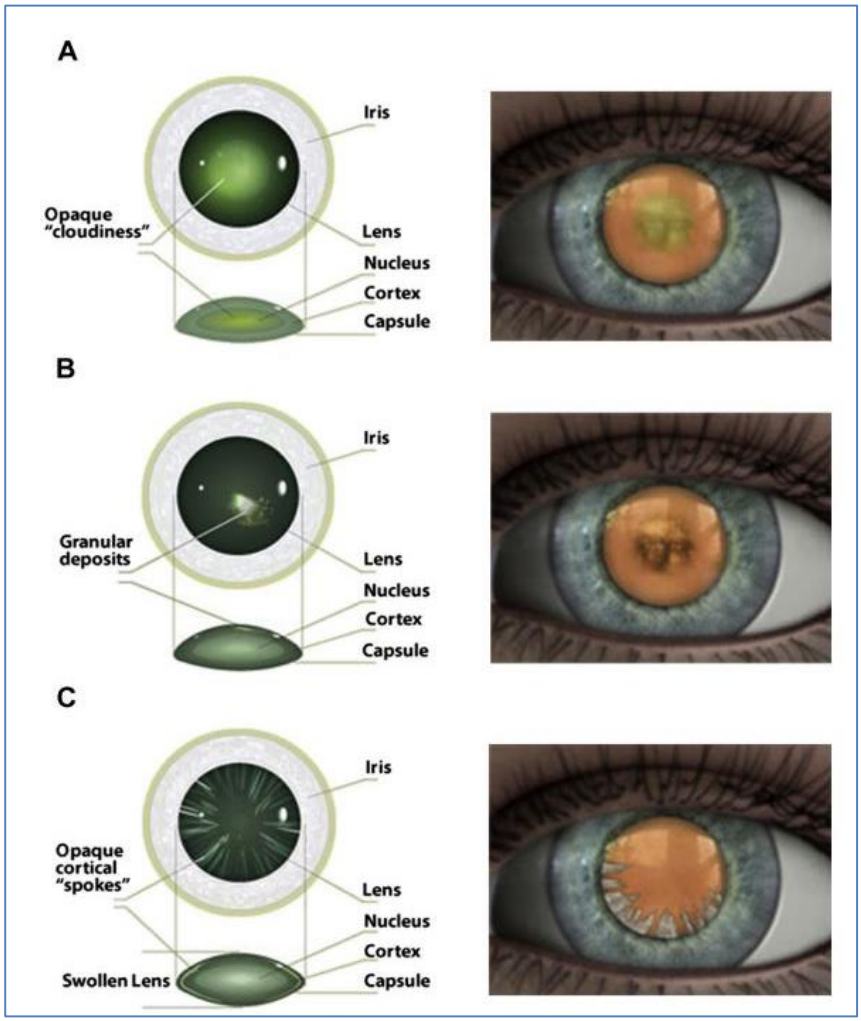

Fig-3: Types of cataracts. (A) Nuclear cataract. (B) PSC cataract. (C) Cortical cataract [4].

There is currently no medical treatment to completely treat or reverse cataract formation, and the only available treatment is surgery. Cataract surgery (the most common phacoemulsification) involves removing the cloudy lens and replacing it with an artificial lens. As in the illustration (Figure 4), at the beginning of the operation, a small incision (2 mm - 3 mm) is made at the edge of the cornea. Next, the lens capsule is opened at the front. The inner core and outer cortex of the lens are then broken up into small pieces using ultrasound and sucked out through the small cut (phacoemulsification). Once the old lens has been removed in this way, an artificial lens is implanted. The artificial lens lasts a lifetime. Stitches are usually not needed at the end of the operation because the cut is so small which allows for self-sealing [5, 10].

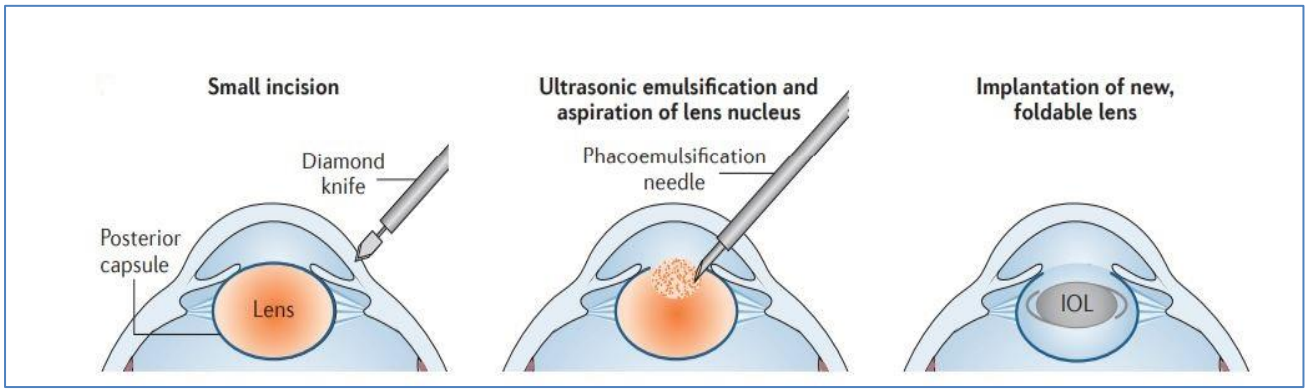

Fig-4: Simplified schematic diagram showing phacoemulsification surgery. Only a small incision into the cornea is needed. The lens nucleus is broken down by ultrasonic emulsification and aspirated. A foldable intraocular lens (IOL) is inserted through the incision and implanted through the anterior opening into the remaining capsule [6].

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Cite This Article: Hanan Salem Alhamed (2021). Cataracts: An Overview. *East African Scholars J Med Surg*, *3*(11), 216-219.