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# Challenges in Hypermature Senile Cataract with Intracapsular Cataract Extraction for Wide Zonular Dehiscence: A Case Study

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### Abstract

A cataract is a condition characterized by clouding of the eye's lens. Senile cataracts progress through four stages: incipient, immature, mature, and hypermature. These stages are determined by the degree of lens cloudiness and the extent of lens mass involvement. In the hypermature stage, the entire lens capsule becomes wrinkled, and its contents become either solid and wrinkled or soft and liquid. An 83-year-old female patient presented to the Department of Ophthalmology at RSUD dr. Zainoel Abidin Banda Aceh with a gradual decrease in vision over the past four years. Ophthalmological examination using a slit lamp revealed cloudiness throughout the lens mass, a brownish-white lens color, wrinkling of the anterior capsule, and visible zonular dehiscence at approximately 90 degrees. The patient's left eye pressure measured 23 mmHg. A surgical plan for Intracapsular Cataract Extraction (ICCE) was made. Despite the surgery, the patient's visual function remained poor. Consequently, a second surgery for IOL insertion was scheduled six weeks after the initial procedure. The patient's visual function is anticipated to improve following the second IOL insertion surgery.



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## 1. Introduction

A cataract is a condition characterized by the eye's lens getting clouded. This deteriorates eyesight, making it especially difficult to see particulars clearly. Some individuals find their vision mildly damaged, while others may lose sight quickly. The particular type of cataract will determine how it develops [1, 2]. Blindness due to cataracts is still a major cause worldwide. Data published by WHO in 2012 regarding cataracts as the main cause of blindness worldwide by 51%. In Indonesia, blindness

reaches 1.5% of the population, which accounts for approximately 3 million people [3]. Cataracts usually exist when adults are over the age of 50. The risk rises with age: approximately 20 out of every 100 adults between the ages of 65 and 74 suffer from cataracts, and it affects more than 50 out of every 100 adults over the age of 74 [1].

Senile cataracts are divided into four stages, namely incipient cataracts, immature cataracts, mature cataracts, and hypermature cataracts [4]. Changes in the lens in the

hyperature stage of cataracts is in the form of a wrinkled lens capsule, and its contents become wrinkled solid or soft melting [5]. In the hyperature stage, this is also often accompanied by zonular dehiscence and increased intraocular pressure. This condition can cause difficulties in the management of hyperature cataracts and also affect the results obtained [6]. The management using refractive glasses is only an option in the early stages when the cataract has matured enough to disrupt daily activities, surgical treatment may be recommended, and it can be highly beneficial [7].

A surgical procedure known as Intracapsular Cataract Extraction (ICCE) is utilized to remove the cataractous crystalline lens as well as the surrounding lens capsule. This technique is typically reserved for eyes with mature or hyperature cataracts that are densely brunescant and contain dense nuclei. ICCE may be especially helpful when dealing with zonular absence or weakness. This method was previously used on a 68-year-old woman who reported a gradual decline in her vision in both eyes. Upon examination, it was discovered that she had developed hyperature cataracts with significant brown discoloration and noticeable lens instability. The patient was advised to undergo ICCE, followed by implantation of an anterior chamber lens in her left eye due to the possibility of lens dislocation. As a result, her left eye's visual function improved [8].

In this case report, we present a case overview of a hyperature senile cataract accompanied by zonular dehiscence issues. The chosen treatment for the patient involved performing ICCE.

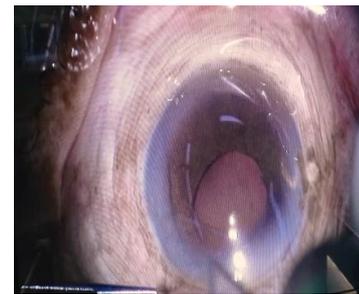
## 2. Cases

An 83-year-old female patient arrived at the Department of Ophthalmology, RSUD dr. Zainoel Abidin Banda Aceh, on July 7th, 2023, with the primary complaint of a gradual decrease in her vision that began four years ago. The patient also reported experiencing pain in the left eye and head for the past month. The patient had previous cataract surgery on her right eye about 15 years ago. There was no history of trauma, red eyes, and previous use of steroid eye medication. The patient also had no history of diabetes mellitus and hypertension. Physical examination of the patient revealed compos mentis consciousness, blood pressure was 125/78 mmHg, the pulse rate was 75 beats per minute, the breathing rate was 20 beats per minute, and the temperature was 36.7 °C.

The patient's visual acuity was 4/60 on the right eye and 1/~ on her left eye. From the ophthalmological examination using a slit-lamp (BioVid), it was found that



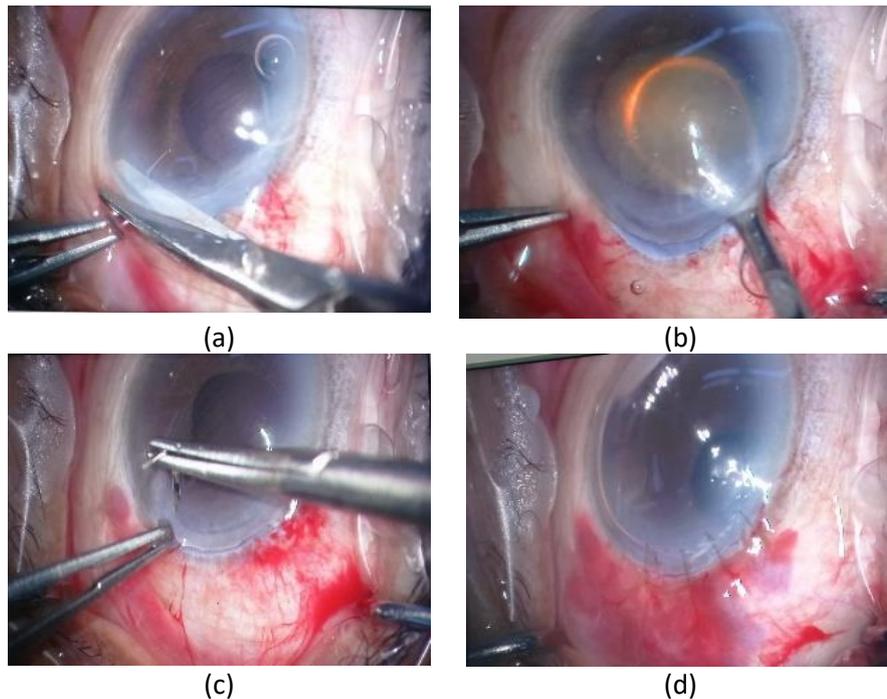
**Figure 1.** The patient's left eye.



**Figure 2.** Preoperative image of the ICCE on the patient's left eye.

the lens of her left eye was cloudy throughout the lens mass, the lens color was brownish white, the anterior capsule looked wrinkled, and zonular dehiscence was visible about 90° (Figure 1). A non-contact tonometer examination (Rodenstock) showed the patient's right eye pressure was 17 mmHg, and the left eye pressure was 23 mmHg. The patient was diagnosed with hyperature senile cataract oculus sinister (OS). The refractive power of the intraocular lens (IOL) as determined using biometry (Tomey) was 20.00 D. Laboratory tests, chest X-rays, consultation with the cardiology department, and anesthesia were carried out to obtain approval for surgery under general anesthesia. The patient is at moderate risk for general anesthesia.

On Wednesday 12th July 2023, cataract surgery was performed on this patient under general anesthesia. The patient was in the supine position and the operating area was disinfected with 10% Povidone Iodine and attached with an eye drape and eye speculum (Figure 2). During the surgery, the lens was seen detached from its hanger at about 270°, then lens extraction was conducted using the ICCE operation method (Figure 3). The IOL implantation was not performed, then the operator performed the suture between the cornea and sclera with 4 stitches using vicril 10.0. Then, a subconjunctival injection of Gentamicin and Dexamethasone was performed with a ratio of 1:1. The surgical site was covered with sterile gauze. Finally, the operation was done. The patient got some post operative medication



**Figure 3.** Stages of ICCE surgical procedure: a) the operator did the wide incision on the cornea; b) the cataract is extracted; c) the operator stitched the cornea and sclera; d) the surgery was done successfully.

such as Cefadroxil tablets 500 mg twice a day, Diclofenac sodium tablets 50 mg twice a day, Lansoprazole 30 mg once a day, Glaucon 250 mg twice a day, Levofloxacin drops 6 x 1 drops a day, Neomycin Sulfate and Dexamethasone combination drops 6 x 1 drops a day, and Timolol drops 0.5% 2 x 1 drop a day. Furthermore, the patient was planned to get an evaluation at the ophthalmology department at RSUD dr. Zainoel Abidin Banda Aceh on the next week, two weeks, and four weeks after surgery.

### 3. Discussions

Cataract is described as opaqueness inside the clear lens of the eye that lowers the intensity of penetrating light and leads vision to deteriorate. Natural lenses are crystalline substances with a specific structure of water and protein that allow light to flow through. Cataract is frequently compared to gaze by a curtain of water [9]. Cataracts that are related to age or senile cataract typically arise after a person reaches the age of 45 to 55 years, and the lens is usually clear prior to that. These types of cataracts tend to worsen over time and are prevalent among the population. The development of age-related cataracts is typically caused by a combination of environmental factors and genetic predisposition, which affects the lens proteins. As the lens ages, its crystallins undergo various kinds of modifications. These changes are often triggered or accelerated by factors such as oxidative damage, UV exposure, osmotic stress, and other forms of harm. Studies have shown that these

environmental risks are independently associated with the development of cataracts. The changes to lens crystallins include proteolysis, an increase in disulfide bridges, phosphorylation, nonenzymatic glycosylation, carbamylation, deamidation of asparagine and glutamine residues, and racemization of aspartic acid residues, among others. These modifications are more prevalent in lenses with cataracts, as well as in *in vitro* or model systems where animals are exposed to similar environmental insults as those observed in human age-related cataracts [10].

The patient's left eye visual acuity was very poor. This condition is related to the stage of the cataract that was suffered by the patient, namely the hypermature stage, that the vision will decrease as the cataract stage increases [11]. There are four stages of cataract maturation: incipient, immature, mature, and hypermature [4]. Incipient cataracts can be detected early if there is a clear part between the lens layers. Immature cataracts appear as grayish white cloudiness, but the iris shadow can still be seen. The shape of the lens becomes more convex and hydration occurs more quickly during this phase. The cataract continues to mature and eventually forms intumescent cataracts that narrow the angle of the anterior chamber. The mature cataract has opacities that reach the cortex of the lens, resulting in a bright white bar lens. In the hypermature phase, the cortex melts and causes the nucleus to shift into the posterior, known as Morgagni Cataract. The lens can also become sclerotic, resulting in shrinkage, which

can produce an image of the anterior chamber angle and narrowed iris [12, 13].

The patient's intraocular pressure on her left eye was high, which is about 23 mmHg. This condition occurs due to 90° zonular dehiscence so that there is vitreous in the anterior part of the lens. There are two mechanisms by which secondary glaucoma develops in hypermature cataracts. It could be due to zonular dehiscence or it could be due to phacolytics where lens protein leaks and enters the anterior chamber and is engulfed by macrophages. So that the macrophages become swollen and clog the trabecular network which increases eye pressure [5].

In general, there are several types of cataract surgery that can be performed, namely extracapsular cataract extraction (ECCE), extraction intracapsular cataract (ICCE), Manual small incision cataract surgery (SICS) and phacoemulsification techniques. Phacodonesis, decentration of the capsular bag, and occasionally vitreous protrusion into the anterior chamber may reveal zonular incompetence intraoperatively. If the zonular disruption is severe, the surgeon might choose ICCE or ECCE instead of phacoemulsification. Samuel Sharp performed the first ICCE procedure in 1753. This surgery is rarely done nowadays, but it may still be indicated, for example, in situations with traumatic cataract, when the zonule is damaged. This action is performed by removing the entire lens together capsule using a cryoprobe and removing through an incision in the superior wide cornea. ICCE is infrequently performed because of decreasing complication rates with improved surgical procedures today [13, 14].

Usually, cataract surgery in adults is performed under local anesthesia, but in this case, it was performed under general anesthesia because the patient had an advanced stage of senile cataract with zonular dehiscence complications and secondary glaucoma. Which will cause severe pain during surgery if done under local anesthesia. This can make the patient suffer more, and be uncooperative because of the intense pain which can complicate the operation process [15]. From this case, we urge that cataract surgery be carried out not at an advanced stage, bearing in mind the complications that can occur in advanced stage cataracts where this will affect visual function that remains poor (not as expected) after surgery and also requires higher costs because it has to be done under general anesthesia, and often requires a second surgical procedure for the patient to have the IOL re-installed [16]. The IOL implantation is usually done after the inflammatory process subsides about one to two months after the first surgery. Treatment costs will be higher because patients use a

greater number of different types of drugs and it takes longer postoperatively than if the operation is performed at a non-advanced stage [6].

In this patient, the visual function was still poor (not as expected) because the IOL could not be inserted due to zonular dehiscence so there was no capsular support to place the IOL. This patient was planned to undergo secondary surgery six weeks later for IOL implantation, which is called as iris claw lens. After the second procedure of surgery for IOL insertion, the visual function will improve.

#### 4. Conclusions

A cataract is a condition characterized by the eye's lens getting clouded. Cataracts that are related to age or senile cataract typically arise after a person reaches the elderly age. As it is known that cataract is classified based on their maturation level. Hypermature stage of cataracts can have complications such as enlargement of the eyeball, and zonular dehiscence. This can complicate the management of cataracts and lead to higher medical costs, requiring repeated surgeries and inappropriate visual function after surgery. Individuals with highly concentrated cataracts and significant overall zonular weakness may benefit from the ICCE method for lens extraction. Nowadays, this technique is rarely performed due to its complexity and complications. We recommend cataract surgery before the complications arise and the surgeons should be proficient in all methods, including ICCE, despite its challenges.

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