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EVOLUTION OF CATARACT SURGERY FROM AYURVEDIC ERA TO MODERN ERA

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ABSTRACT

Cataract surgery ranks among the most prevalent procedures conducted globally. It is also one of the earliest surgical techniques. With the progress made in cataract surgical methods, there have been enhancements in intraocular lens replacement technology as well. Cataract surgery might be regarded as one of the most effective interventions in the field of medicine. This article explores the intriguing development of cataract surgery, beginning with the initial technique of couching and leading up to contemporary gold standard of phacoemulsification and lens replacement. Ayurveda, regarded as the science of life, has been aiding humanity in both health and disease since its inception. Shalakya Tantra, a specialized branch of Ayurveda, focuses on the study of Ophthalmology, Otorhinolaryngology, Orodental surgery, and Head. The literature pertaining to this specialty is derived from the original text of Nimi Tantra in the Uttartantra of the Sushruta Samhita.

KEYWORD: ICCE, ECCE, Couching, Phacoemulsification, IOL, Shalakya Tantra, Lingnasha.

INTRODUCTION

The crystalline lens of the eye is typically a transparent structure held in place by zonular fibers connected to the ciliary body in patellar fossa. The lens is made up of a capsule, lens epithelium, cortex, and nucleus. Its primary roles are to refract light to create a clear image on the retina and to enable accommodation. A cataract occurs when the crystalline lens becomes

opaque, resulting in impaired vision. Numerous factors can contribute to the development of cataracts, with aging being the most prevalent cause, characterized by multiple contributing elements.[1]

In 1998, it was estimated that around 20 million individuals across the globe were blind due to cataracts.[2] This number was expected to double by the early twenty-first century.[3] It still seems like many years will pass before there is a pharmacological preventive or therapeutic treatment for this illness. Consequently, cataract surgery is the only practical option. Intraocular lens (IOL) implantation has become a more common surgical procedure. Restoring and maintaining pre-cataract vision while reducing additional cataract-related symptoms is the ultimate goal of cataract surgery. The methods and strategies used by cataract surgeons have continuously changed over time in their pursuit of perfection. Therefore, a broad spectrum that includes laser-assisted cataract removal and intracapsular cataract extraction (ICCE) is the most accurate way to depict the current trends in cataract surgery.

The transparent corneal sutureless phacoemulsification technique is the result of numerous advancements in cataract surgery equipment and methods over the last 20 years.[4,5,6] Since Harold Ridley introduced the IOL in 1949, there have also been significant advancements. Some of the more recent lens designs address not only the clarity of optical transmission, but also the depth of focus, providing results that mimic the human lens.[7,8]

MATERIAL AND METHOD

Couching and mature cataract

Couching was the first cataract surgery introduced by Sushruta from india in 600 B.C in couching the cataractous lens was pushed into the vitreous cavity this technique was practiced world over till 18th century.[9]

The earliest known method of treating a cataract is couching, which dates back to the fifth century BC.[10] The word “couching” comes from the French verb “coucher,” which means “to put to bed.” Couching was typically performed on mature cataracts. The cataract was not removed from the eye. Rather, a needle was used to deliberately remove the mature cataract from the visual axis. The cataract was still there in the eye, but it was no longer obstructing light, resulting in an immediate improvement in vision. In fact, couching was deemed successful in the immediate postoperative period, but the retained cataractous lens and the

absence of aseptic method soon had detrimental consequences on the eye, frequently leading to blindness soon after the treatment.[11]

The father of Indian cataract surgery, Sushruta, was perhaps the first to describe extracapsular cataract surgery[12] and the instruments to be used specifically for this. The main method of lens extraction in the first half of the 20th century was ICCE, which required the complete removal of the lens and its capsule via a large 180° limbal incision. This method was assisted by mechanical or chemical splitting of zonular fibers. The typical complications associated with the procedure included vitreous loss, bleeding, retinal detachment, persistent cystoid macular edema, and significant astigmatism. Additionally, it was linked to an extended recovery period. The emergence of the IOL in the latter part of the 20th century led to extracapsular cataract extraction (ECCE) replacing ICCE.

Extracapsular cataract extraction

The procedure is termed "extracapsular" because the lens capsule is left in place. The initial genuine cataract surgery occurred in 1747, in Paris, conducted by the French physician Jacques Daviel. His technique proved to be more efficient than couching, achieving an overall success rate of 50%.**[13]** Daviel's method mainly consisted of creating a significant corneal incision (over 10 mm), puncturing the lens capsule, expressing the nucleus, and subsequently removing the lens cortex through curettage.

Although there were risks associated with Daviel's procedure, it continued to be the standard technique for cataract extraction for more than a century, until the 19th century, when intracapsular cataract extraction (ICCE) temporarily emerged as the favored method for cataract removal. Nonetheless, advancements in surgical techniques and instruments ultimately resulted in the resurgence, during the 1970s, of ECCE as the favored method over ICCE, which lost popularity due to elevated instances of sight-threatening complications. Contemporary iterations of ECCE and manual small incision cataract surgery (MSICS) are currently utilized in various regions globally, including the United States. Methods for conducting extracapsular cataract extraction have significantly advanced over time, resulting in an overall success rate of 90% to 95%.**[14]**

Intra capsular cataract extraction

In 1753, Samuel Sharp carried out the initial recorded intracapsular cataract extraction (ICCE).**[15]** With ICCE, the complete lens, along with the lens capsule, is extracted via a

significant limbal incision. Samuel Sharp utilized his thumb to push the cataract out of the eye. Breaking the zonular fibers that hold the lens in place within the eye was an essential aspect of the ICCE procedure. The method of breaking the zonules has progressed from the initial use of forceps to grasp the lens capsule and physically rupture the zonules. In 1957, Joaquin Barraquer became the first surgeon to use the enzyme alpha-chymotrypsin for the dissolution of lens zonules.[16] Cryoextraction was also shown to be an effective technique for ICCE. Cryoextraction involves using a frozen probe that touches the cataract, causing it to stick to the probe, and then the cataract is carefully removed from the eye. The effectiveness of ICCE increased with the introduction of contemporary anesthetic and sterilization methods, but its appeal quickly diminished as advancements in ECCE techniques were achieved. The primary disadvantages of ICCE involve the complete extraction of the lens and lens capsule. The lens capsule acts as a barrier separating the eye's anterior and posterior components. Complications that may lead to blindness from ICCE, including retinal detachment, macular edema, and corneal decompensation, are more probable if this barrier is absent, allowing the vitreous to protrude forward. Additionally, ICCE necessitates bigger incisions for cataract removal, resulting in prolonged healing and increased surgically induced astigmatism.

Modern cataract extraction and phacoemulsification

In 1967, American ophthalmologist Charles Kelman transformed cataract surgery by introducing phacoemulsification (commonly known as "phaco") as an alternative method to ECCE.[17] With traditional ECCE, the entire lens nucleus is extracted from the eye via a large (10 mm) incision. In phacoemulsification, an ultrasound-powered needle breaks up and removes the lens via a much smaller (3 to 4 mm) incision. Phacoemulsification faced initial opposition, but it is now regarded as the safest and preferred cataract surgery method in developed countries.

The introduction of ophthalmic viscosurgical devices (OVDs) in 1972 enhanced the ease and safety of the procedure as well. An OVD is a gel-like material utilized in cataract procedures to preserve the eye's space, preventing the globe from collapsing and safeguarding the internal eye structures without disrupting the surgical process.

Evolution of IOL

The incredible success of cataract surgery would not have been possible without the development of intraocular lenses (IOL). Sir Harold Ridley is credited with having carried

out the first successful IOL implantation on 29 November 1949 at St Thomas' Hospital, London. Before intraocular lenses (IOLs) became available, patients were left without a lens (aphakic) after cataract surgery. After the procedure, these aphakic individuals needed strong hyperopic glasses to refract light and focus images correctly on the retina. Consequently, a patient experiencing vision loss from a cloudy lens would undergo cataract surgery, only to discover that, without corrective lenses, their vision remained poor due to the lack of a natural lens.[18] A medical student collaborating with Ridley reportedly inquired about the possibility of substituting the cataractous lens with a transparent one. Sir Harold Ridley observed that injured World War II pilots could tolerate plastic fragments from shattered airplane windshields in their anterior chambers, and this insight motivated him to introduce an intraocular lens (IOL) made of polymethyl methacrylate (PMMA), commonly referred to as acrylic glass. At first, Ridley's method received minimal backing, as there were significant postoperative issues, including glaucoma, uveitis, and displacement of the implanted lens.

IOLs can be placed in the anterior chamber, attached to the iris, in the capsular bag, or in the ciliary sulcus, which is the area between the anterior lens capsule and iris.

On May 13, 1952, Baron created and implanted the first anterior chamber intraocular lenses (ACIOLs).[19] Barraquer (1957) described the use of alpha-chymotrypsin to induce zonular lysis and so enable intracapsular cataract surgery. Krawicz, a Polish ophthalmologist, promoted cryoextraction of the crystalline lens in 1961. As a result, anterior chamber designs with lens fixation in the angle recess were the main focus of lens design.

ICCE, which removed the entire lens, including the lens capsule, was the most common procedure of cataract extraction when IOL implantation was first introduced. As a result, the IOL had to be placed in the anterior chamber or fastened to the iris. Long-term eye safety was incompatible with early lens designs.

For instance, anterior chamber IOLs frequently caused corneal endothelium injury by spinning about in the anterior chamber. Pupil distortion and uveitis-glaucoma-hyphema (UGH) syndrome were frequently caused by iris-fixated lenses.

IOLs were created with posterior chamber implantation in mind when ICCE lost favor. IOL design is credited to Steven Shearing, an American ophthalmologist. He created a lens in the 1970s that could place itself behind the iris, the same location as the natural lens. The

capsular bag, a more structurally stable location for the IOL to dwell, was developed as cataract surgical procedures advanced.

The first folding lens was introduced in 1980, which significantly enhanced results. Foldable IOLs can be inserted into the eye with an even smaller incision because they are constructed of flexible materials like silicone or acrylic. Significant progress has been made in IOL technology, design, and material since the 1970s.

In 1992, astigmatism correction became possible when the first toric IOL was developed.[20] Since then, improvements in the toric IOL model have led to excellent results and increased freedom from spectacle correction.

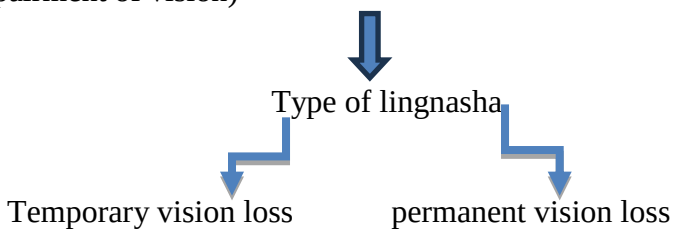
DISCUSSION

One of the main causes of blindness, which can be either irreversible or reversible depending on its type, is linganasha. The only variety that can be surgically treated is Kaphaja Linganasha; all other types are incurable. Daivakrita Chhidra (Key hole), which is the intersection of medial 2/3rd and lateral 1/3rd of the area between limbus and outer canthus in interpalpebral space, is the recommended site of puncture/incision for linganasha/cataract surgery. This area is measured with a Vernier calliper, and the average measurement is 9 mm. Therefore, on the temporal interpalpebral area, the Daivkrita chhidra (natural point) should be roughly 6 mm from the limbus.

Linganasha Vedhani shalaka is shaped like a jasmine flower bud, which is spherical and spindle-shaped with a base that resembles a slender petiole. When the shalaka is being scrapped, this design guarantees the easy and spontaneous removal of cortical matter from the sides of the neck through the wound gap created by the wide spindle-shaped tip. This method is similar to extra-capsular cataract extraction and is described in Sushruta Samhita (reproduced from Nimitantra).

AYURVEDA CORRELATION

- Linganasha (impairment of vision)[21]



Pathogenesis (samprapti)

vitiated doshas (body humours)

⇩

invade 4th patala of eye (lens)

⇩

pupil gets covered by doshas

⇩

decreased vision, only bright objects visible

(posterior segment normal)

⇩

This stage of timira = lingnasha (cataract)

Clinical feature of kaphaja lingnasha

- Almost total blindness
- Only strong light perception
- White, smooth, thick pupil
  (like water drop on lotus leaf)
- Pupillary reaction present
  (dilates in dark , constrict in light)
- On massage pupil shifts shape

Modern correlation

Mature / hypermature senile cataract (white, soft, cortical type)

Prognosis

- Kaphaja linganasha = treatable
- Other types = incurable

Surgical management (ayurveda)

Daivakrita chhidra (surgical point)

⇩

Location

- Between limbus & outer canthus
- Junction of medial 2/3rd and lateral 1/3rd
- Interpalpebral area (temporal side)

⇩

Measurement

- 9 mm total region
- Incision point 6 mm from limbus

CONCLUSION

Cataract surgery is regarded as one of the most effective procedures in the entire field of medicine. Due to ongoing improvements in methods and technology, cataract surgery has transformed into a refractive process rather than merely a surgical solution for cataracts. However, in spite of the global accessibility of various IOL brands, materials, and types, not every lens is appropriate for each patient (and not every lens is reimbursed by health insurance providers). In contemporary medical science, Kaphaja Linganasha appears to be the appropriate term for the eye condition known as cataract. Since the beginning of Ayurveda, Rajarishi Nimi, the monarch of Videha, has been the primary contribution to the field of ophthalmology. As such, he merits recognition.

REFERENCE

1. Petrash JM. Aging and age-related diseases of the ocular lens and vitreous body. Invest. Ophthalmol. Vis. Sci., 2013; 54: ORSF54–ORSF59. doi: 10.1167/iovs.13-12940. [DOI] [PMC free article] [PubMed] [Google Scholar]
2. Apple DJ, Ram J, Wang XH, Brown S. Cataract surgery in the developing world. Saudi J Ophthalmol. 1995; 9: 2–15.
3. Isaacs R, Ram J, Apple DJ. Cataract blindness in the developing world: Is there a solution? J Agromed., 1996; 3: 7–21.
4. Linebarger J, Hardten DR, Shah GK, Lindstrom RL. Phacoemulsification and modern cataract surgery. Surv Ophthalmol. 1999; 44: 123–147.
5. Fichman RAFine IH, Fichman RA, Grabow HB. The clear-corneal incision and astigmatism strategies. Clear-corneal cataract surgery and topical anesthesia. 1993 Thorofare, NJ Slack Inc.:72–76.
6. Boyd BF. Personal interview between the editor and RC Troutman, D Paton, S Ryan. Present trends in incision closure of the cataract wound Highlights Ophthalmol 1975-1976; 14: 176–204.
7. Ridley H. Intraocular acrylic lenses: A recent development in the surgery of cataract. Br J Ophthalmol. 1952; 36: 113–122.

8. Apple DJ Sir Harold Ridley and his fight for sight: He changed the world so that we may better see it. 2000 Thorofare, NJ Slack Inc.
9. AK khurana comprehensive ophthalmology 9th edition ch 9 Disease of lens 187.
10. Bobrow JC, Blecher MH, Glasser DB, Mitchell KB, Rosenberg LF, Isbey EK, III, Reich J. AAO Basic and Clinical Science Source (BCSC) Lens and Cataract (91-161) Singapore: American Academy of Ophthalmology; 2008. Surgery for cataract. [Google Scholar]
11. Isawumi MA, Kolawole OU, Hassan MB. Couching techniques for cataract treatment in Osogbo, South West Nigeria. Ghana Med. J., 2013; 7(2): 64–69. [PMC free article] [PubMed] [Google Scholar]
12. Kansupasa KB, Sassani JW. Sushruta the father of Indian surgery and ophthalmology. Doc. Ophthalmol., 1997; 93: 159–167.
13. Rucker CW. Cataract: a historical perspective. Invest Ophthalmol. 1965; 4: 377–383. [PubMed] [Google Scholar]
14. Haripriya A, Chang DF, Reena M, Shekhar M. Complication rates of phacoemulsification and manual small-incision cataract surgery at Aravind Eye Hospital. J Cataract Refract. Surg., 2012; 38(8): 1360–1369. doi: 10.1016/j.jcrs.2012.04.025. [DOI] [PubMed] [Google Scholar]
15. Hubbell AA. Samuel Sharp, the first surgeon to make the corneal incision in cataract extraction with a single knife: A biographical and historical sketch. Med. Library Hist. J., 1904; 2(4): 242, 1–268. [PMC free article] [PubMed] [Google Scholar]
16. Barraquer J. Drugs and instruments used in cataract surgery. Am J Ophthalmol., 1966; 61(1): 184–185. [Google Scholar]
17. Kelman CD. Phaco-emulsification and aspiration: a new technique of cataract removal: a preliminary report. Am J Ophthalmol. 1967; 64(1): 23–35. [PubMed] [Google Scholar]
18. Williams HP. Sir Harold Ridley's vision. Br J Ophthalmol. 2001;85(9):1022–1023. doi: 10.1136/bjo.85.9.1022. [DOI] [PMC free article] [PubMed] [Google Scholar]
19. Apple DJ, Mamalis N, Olson RJ, Kincaid MC *Intraocular lenses: Evolution, designs, complications, and pathology*. 1989 Baltimore Williams & Wilkins: 107–173 Cited Here
20. Visser N, Bauer NJ, Nuijts RM. Toric intraocular lenses: historical overview, patient selection, IOL calculation, surgical techniques, clinical outcomes, and complications. J Cataract Refract. Surg., 2013; 39(4): 624–637. doi: 10.1016/j.jcrs.2013.02.020. [DOI] [PubMed] [Google Scholar]

21. Sushruta Samhita with Nibandhasangraha commentary of Dalhana, edited by Acharya Trivikramji Yadavaji, 1st Edition, 1997, Uttar. 7/15-17; Choukhambha Ibid. (1) (30-31).Uttar. 7: 15. [Google Scholar]