



Review Article

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PARS PLANA LENSECTOMY AND SUSHRUTA'S CHEDANA FOR CATARACT: A REVIEW

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ABSTRACT

Jacques Daviel, a French ophthalmologist, is considered the father of cataract surgery for his revolutionary idea of extracapsular lens extraction technique, which was introduced in the eighteenth century. Prior to his concept, couching was prevalent in the millennia. Sushruta Samhita, a text dated between 800 BC - 1000 BC, has some descriptions of surgical technique with an extraocular expulsion of the lens with a Pars Plana incision/puncture. A proper analysis of Sushruta Samhita and its description of cataract surgery is necessary to understand the significance played by this ancient Indian surgeon in the evolution of present-day ophthalmology and the days of yore.

Keywords: Extracapsular lens extraction, Linga nasha, Pars Planar incision, Sushruta

INTRODUCTION

A cataract is a pathological condition characterised by the opacification of the eye's lens, leading to vision disruption, such as blurriness, alterations in colours, halos around light, and potential blindness. While there are various causes and risk factors for the development of cataracts, the most common is senile cataracts, attributed to ageing ¹. It is not surprising that cataracts are a significant cause of blindness globally, affecting over 20 million individuals in 2010, with an increasing incidence expected². Historically, before the 1700s, some believed cataracts were caused by a liquid material flowing through the lens. Hence, the term originates from the Latin word "cataracta," meaning waterfall, possibly due to the resemblance of a dense cataract to a waterfall to some observers ³. When cataracts lead to visual impairment, surgical intervention is currently the sole treatment method. Fortunately, due to technological advancements, cataracts can now be removed and replaced with an intraocular lens (IOL) with a low rate of complications. Surgeons of yore employed the couching technique; however, historical texts dating back to 600 BC reveal the utilisation of a basic extracapsular cataract extraction (ECCE) method, where the lens is extracted while the lens capsule is left intact, performed by an Indian surgeon named Sushruta. An interpretation of the Sanskrit original text unveils the specific surgical procedure.

Couching the forefather of cataract surgery

Cataract surgery through "couching" (lens depression) is considered one of the oldest surgical techniques. This method involves utilising a sharp instrument or probe to push the cloudy lens to the bottom of the eye, typically into the vitreous chamber - and out of the visual axis. Ancient Indian surgeons were known to practice couching and meticulously documented this

procedure. Subsequently, the practice of couching spread globally, with evidence indicating its widespread use in China, Europe, and Africa. However, following the introduction of modern cataract surgery in the 19th century AD (Intra ocular extraction of lens (1748)), couching gradually declined in popularity, although it continues to be utilised in some areas of Asia and Africa⁴. Nevertheless, the absence of a proper aseptic technique and the harshness of the procedure led to unfavourable results. Some frequent complications consist of secondary glaucoma, hyphema, and endophthalmitis, which frequently culminate in loss of vision⁷.

ECCE – The game changer in cataract surgery

For centuries, despite some evidence of primitive ECCE, couching remained the primary cataract procedure until 1747. This year, French surgeon Jacques Daviel, often hailed as the pioneer of modern cataract extraction surgery, conducted an ECCE. His technique involved making a corneal incision larger than 10 mm with a corneal knife, puncturing the capsule with a blunted needle, and extracting the lens using a spatula and curette. Post-operative care included dressing the eye with a cotton dressing soaked in wine and resting in a darkened room for a few days. Although this marked a significant improvement over couching, complications such as posterior capsular opacification, retained cataracts, and infections were still common.⁵

Sushruta And ECCE

In the 'Sushruta Samhita: Uttara Tantra' (an addendum), Sushruta dedicated chapter VII to discuss the cataract disease, specifically focusing on the pathology of the diseases which are peculiar to the drishti of the eye (Drishti-Gata-Roga-VijnāNiya)⁶. Similarly, chapter XVII, titled Drishtigata Roga Pratishedha, outlines

various treatment options for this condition. Part 6 of this chapter elaborates on the surgical measures recommended for treating a case of Kaphaja Linga Nasa (obstruction at the pupil with a cataract) caused by the deranged Kapha, advocating for a primitive extracapsular cataract extraction (ECCE) method where the lens is extracted while preserving the lens capsule.⁷

The surgeon uses a pointed needle to pierce the eye, going through the watery fluid until reaching the lens covering, where an opening would be made. The patient was then advised to perform a Valsalva manoeuvre by closing one nostril, which resulted in the expulsion of lens material through the incision and improved vision. After the surgery, a bandage made from local plants was applied, and the patient was instructed to remain in a horizontal position and refrain from engaging in strenuous activities such as coughing and sneezing⁸.

The excerpt below is from the Sushruta Samhita translation by Vaidya PV Sharma.

In moderate season, after unctio and sudation, the patient should be positioned and held firmly while gazing at his nose steadily. Now the wise surgeon, leaving two parts of the white circle from the black one towards the outer canthus, should open his eyes properly free from the vascular network and then with a barley-tipped rod-like instrument held firmly in hand with middle, index and thumb fingers should puncture the natural hole-like point with effort and confidence not below, above or insides. The left eye should be punctured with a right hand and vice-versa. When appropriately punctured, a drop of fluid comes out, and there is some typical sound.

After puncturing, the expert should irrigate the eye with breast milk and foment it from outside with Vāta-alleviating tender leaves, irrespective of whether the dosha is stable or mobile, holding the instrument properly. Then, the pupillary circle should be scraped with the tip of the instrument while the patient. Closing the nostril of the side opposite to the punctured eye should blow so that kapha located in the region can be eliminated. When the pupillary region becomes clear like a cloudless sun and is painless, it should be considered appropriately scraped. If dosha cannot be eliminated or re-appears, the puncture is repeated after unctio and sudation.

When the sights are correctly seen, the salākā should be removed slowly, the eye anointed with ghee and bandaged. Then, the patient should lie supine in an isolated chamber. Patients should avoid belching, coughing, sneezing, spitting, and shaking during the operation, and after that, they should observe the restrictions as they do after intake of sneha⁸.

Sushruta proposed a method of removing lens material through a Pars Plana Incision. The liquefied lens contents were disrupted and partially expelled through a small incision using a Valsalva manoeuvre by scratching the pupil. He mentioned a pars plana approach instead of limbal puncture, usually used in extracapsular cataract extraction, but did not discuss a large enough incision for complete lens extraction. Therefore, in immature cataracts, the lens has to be sublaxated into the vitreous cavity (couching procedure) to remove it from the visual axis. Sushruta even suggested repeating the puncture if the cataract returned, as the lens could float back up after dislocation. In summary, Sushruta may have described a form of extraocular lens material evacuation through a pars plana approach.

Pars Plana Approach in lensectomy and Chedana Karma of Sushruta

The ciliary body is situated behind the iris and consists of the pars plicata and the pars plana. The pars plicata makes up the front portion and is connected to the back surface of the iris. It accounts for approximately 25% of the entire ciliary body. On the other hand, the pars plana, the back part of the ciliary body, is adjacent to the choroid at the ora serrata. This structure is about 4 mm long and is located further away from the corneal limbus. The pars plana is preferred for PPV as it provides easy access to the vitreous with minimal trauma to the eye. This approach allows the treatment of various vitreoretinal diseases in the posterior segment. In some instances, removal of the crystalline lens may be necessary during pars plana vitrectomy. For instance, if there is poor visualisation of the posterior segment due to a cataract, phacoemulsification or pars plana lensectomy can be performed. Also, if retained nucleus or cortical fragments cause inflammation and increased intraocular pressure, pars plana lensectomy is required. In cases of proliferative vitreoretinopathy, removing both the crystalline lens and lens capsule may be beneficial to prevent future membrane growth⁹.

A careful examination of the procedure detailed by Sushruta, where he instructs to make the incision from an avascular area, points to the fact that he was aware of the Pars Plana approach. Sushruta might have developed this technique after a thorough examination of the anatomy of the eye.

CONCLUSION

The incompetency with the ancient language of Sanskrit may be a reason for the lack of recognition of Sushruta in modern times and the West. However, the stalwart surgeon of the pre-medieval period has shown his competency even in plastic and trauma surgery. The Western world has long overlooked and remained oblivious to the early Indian medical advancements. This is demonstrated by the absence of any mention of ancient Indian medicine in numerous books on the history of medicine. Several factors contribute to this situation. Firstly, the complexity of Sanskrit, the language in which most ancient texts are written, makes it extremely challenging to comprehend. Secondly, the scarcity of Sanskrit scholar-physicians who can translate these materials into Western languages further hinders the dissemination of knowledge.

Additionally, the practice of Ayurveda, a traditional Indian medical system, was closely guarded as a family secret by the priestly class, which were its practitioners. Nevertheless, the revival of Ayurveda in modern days has catapulted the fame of this great surgeon from ancient India. Despite all the advancements seen in present-day Ophthalmology, during a time deprived of technologies and rational science, this technique was devised purely based on thorough observation and proper examination of the disease and the patients. Sushruta and his technique of lensectomy for cataracts has left a mark forever in the field of ophthalmology and has been the first documented cataract surgery in the world.

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