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EXTRA CAPSULAR CATARACT SURGERY IN CANINE – A PICTORIAL VIEW

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ABSTRACT

Canines are considered not only as a pet but also a family member in the current world of companionship. The trend of getting pets operated for repairing impaired vision in India has become a common demand from owners. Although the approach of extra capsular cataract extraction is primitive, it has been still recommended in cataract cases of dog due to size, density of cataractous lens and thick capsule. The current algorithmic and pictorial description will help in understanding and learning the technique easily. The criteria for patient selection and surgical procedure (pros and cons) will increase success rates to treat canine cataract and subsequently, confidence among veterinarians.

INTRODUCTION

The lens is, an exceptionally living ocular tissue, which is usually well defined, transparent biconcave objective. It allows light recognition by focusing it on retina (the light-perceptive nervous tissue located in the back of the eye) and stands vertically in eye behind iris to divide it into anterior and posterior chambers. A cataract is an opacity of the lens or lens capsule, histologically death and disruption of lens epithelial causing opacity. This impairs vision from 1 to 100 percent depending on the type of cataract. Cataractous transformations of the lens may seem as opacity in the lens staring as small insignificant dots or a diffuse haze, white strips or a completely white pearl like lens. The cataract usually progresses to involve larger areas of the lens and rate of progression is difficult to predict and may be very slow or quite rapid (worsen overnight) either in one or both eyes. Proportion of the lens opacity prevents formed images from reaching the retina and results in blurred vision.

Senile - (senescent) - lens opacities in dogs > 6 years of age Cloudiness in cataractous lens scatters light as it enters the Cloudiness in cataractous lens scatters light as it enters the eye which initially only result in a blurry image, but may progress to cause blindness. It is very similar to a glass window that is fogged with vapour. The more of the lens is affected; the worse will be the visual impairment. Apart from this available knowledge, there are many misconceptions about cataracts in society of pet owners e.g. it is a film over the eye or a type of cancer or can spread from one eye to the other or causes irreversible blindness. All these false statements need to be informed to the owner. Generally, cataract can be classified into a number of available classification [1] schemes, which are necessary to define breed associated cataract etiologies and prognosis.

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AGE OF ONSET

Congenital – Present at birth or shortly thereafter. Can be from inherited defective genes; maternal infection; toxin induced (DNP); nutritionally induced (arginine deficiency in milk replacers). All are mostly bilateral and may partially resolve.

Juvenile - developmental or early onset between 2-5 years of age. Several causes includes - Inherited; trauma; diabetes; intraocular inflammation etc.

Nuclear Sclerosis - a normal lenticular alteration in most dogs over 6 years.

Location

Capsuar
Subcapsular
Nuclear/Perinuclear
Polar/equatorial

Degree of maturation

Incipient - Earliest lens changes; focal opacity of the lens; and radiations or "spoke" shaped opacities

Immature - Increased size of lens due to absorption of fluid leading to swollen lens (intumescent). Also causes glaucoma sometimes in which fundic reflex still present (usually present peripherally) and vision is impaired to a variable extent.

Mature - Lens totally opaque; fundic reflex absent; vision lost; and the lens usually normal size.

Hypermature - Resorption causing decrease in total lens volume and wrinkling of anterior capsule and may have areas of fibrosis and dystrophic calcification.

Etiology

Inherited

Dominant genes (meaning that only one parent has to transmit the gene for the disease) are: beagles and Chesapeake Bay retrievers. Recessive genes leading to cataracts (both parents must pass on the recessive gene to the affected offspring) are: American cocker spaniel, Boston bull terrier, German shepherd, golden retriever, miniature schnauzer, old English sheepdog, Staffordshire bull terrier, Welsh springer spaniel, Afghan hound, Irish setter, Siberian husky and standard poodle.

- Traumatic
- Metabolic – diabetes, hypocalcaemia
- Toxins –DMSO, DNP
- Nutritional – arginine, vitamin D3
- Secondary to inflammation –uveitis
- Idiopathic

PRA – releases free radicals and toxic substances from degenerating photoreceptor leading to posterior subcapsular cataracts

Diabetes is seen as a common etiology in pet dogs with presentation similar to humans [2]. Heritable cataracts are also noted often in younger animals (as early as 6 months up to 6 years of age) in certain breeds (Siberian husky, Cocker Spaniels, Golden Retrievers, Bichon Frise and Poodles to name a few). These individual dogs that are affected with heritable cataract should not be involved in breeding program and neutered so that they may not pass the defective gene on to future generations. Aged or older dogs (more than 8 years old) are likely to develop cataracts as an aging degeneration, which is similar to human beings. It has been reported to 50% of cataract cases in UK in 2004 [3].

In some cases, this may be a very rapid onset causing acute blindness especially in diabetic cataract. In others, cataract formation may be slow and progressive. Proper control of the diabetes will aid in slowing the onset of cataracts. Electric shock, from biting on electrical cords (common at holiday time) or lightning strike might also result in cataract formation. Traumatic injuries in canines may include a blunt blow or penetrating injury (cat scratch or thorn etc.) resulting in secondary cataract formation.

Development of cataracts may be noted with other diseases of the eye including inflammation of the iris, glaucoma or diseases of the retina known as secondary cataracts, which are poor candidates for cataract surgery.

A thorough eye examination can detect the presence and extent of a cataract as well as any other conditions causing diminished vision e.g. retinopathy or optic neuropathy. In such cases, vision may not return on cataract removal, which indicates the requirement of monitoring dogs for other parameters before cataract surgery to define prognosis and complications.

As an owner of a pet, initially cloudiness to the eye or diminished vision (seems clumsiness, bumping into objects) will be visible and later these changes will simulate cataract and complete loss of vision.

In the past, veterinarians waited for near blindness in both eyes before attempting cataract surgery due to possible uncertainty of success rate in canine cataract surgery. It is also well known that long term success rate will be better for cataract surgery, if the patient is carefully chosen. Also, cataract can be a source of permanent visual impairment, if seepage of proteins from the lens leads to inflammation in the eye. This can lead to glaucoma, which reduces good prognosis. On the basis of above points, removal of the affected lens in the presence of significant visual impairment, using available appropriate technique is advisable.

How to select patient (dog) for surgery?

On owner's perspective

1. Owner must be willing to spend a significant amount of money and provide a significant amount of aftercare.
2. Any inflammation present in the eye must be controlled prior to surgery.
3. The retina should be evaluated prior to surgery to make sure it is functioning.
4. No other disease should be present in the eye.
5. Dog must be cooperative to avoid post operative complications.
6. Dog should be of good health. If dog and owner are compliant for this surgery, then it is worth to proceed.

On veterinarian's perspective

1. Dog should be healthy enough to withstand anesthetic side effects.

2. It has not been operated for major surgery with less than 3 months interval.
3. It should have all possible vaccinations.
4. It should have mature cataract, if performing ECCE.
5. Check for retinopathy or light reflex.

The advent of newer techniques for cataract removal can be possible before maturation without major side effects in humans and animals. Sometimes early removal will achieve a higher success rate for restoration of vision. Some cases have shown with the help of USG waves, the lens is shattered into small fragments for easy removal from the eye. Apart from lens extraction procedures, implanting a permanent artificial lens is an available option for small animals (dogs and cats) for cataract removal to restore clear vision.

Failure or negligible success of medical approaches [4 & 5] to treat cataract recommends using and learning surgical approaches, which provides immediate and viable option. Cataract surgery success is judged in long term follow up which can be achieved with correction in surgical or postoperative errors/lacunae. As other authors associated failure of MECCE to postoperative synechia and glaucoma, whereas failures of phacoemulsification is related to infection and rhegmatogenous retinal detachments [6]. Presently, there are no medications or dietary supplements that have been proven to treat cataracts with assurance, concluding that surgical removal is the only available option to retain or restore vision.

Although many success stories provides ignition to perform cataract surgeries however, complications in such operations [6] plays an important role in preventing further mistakes. In this article, an effort has been taken to put forward simplified steps with pictorial view of clinical presentations (Figure A, B), instrumentation (Figure C), preoperative (Figure D) operative (Figure E, F) and post operative (Figure G) steps.

MATERIALS AND METHODS

A mixer of dry (Figure H1) and wet models is used to train surgeons before applying the knowledge on clinical cases. Animals were examined for the type of cataract and eye abnormality on the basis of few techniques e.g. menaces reflex, pupillary light reflex, schiotz tonometer. Fundus was evaluated using indirect opthalmoscopy.

Instrumentation (Figure C)

In this study, instruments were obtained from human ophthalmic set. Instrument set consisted of. BP blade no. 15, small and large corneal scissor, Lens Scooper, Muscle hook, eye speculum, Auto or manual lid Retractor, Vectis, Double bended 23 G needle (to cut lens capsule), Silk 10-0 and 2-0 suture, 2/3 curved needle, Castroviejo curved needle holder, Derf needle holder, Troutman needle holder, four curved mosquito artery forceps, Bard Parker (B. P.) handle No. 3, Curved Mayo Scissor, Arruga Capsule forceps, Adson tissue forceps, Castroviejo forceps with tying platform, Castroviejo lid speculum, Silicone irrigating bulb, anterior chamber needle and Cannula.

Light from microscope was reduced to low values when not used and cornea was often kept wet with sterile saline. A day before operation, Balanced Saline Solution (BSS) was autoclaved and cooled for eye irrigation while surgery to keep eye wet. Avoiding excessive and unnecessary light exposure from microscope reduced damages of delicate structures of eye from drying and burns injury. For zoomed visualization, magnification table mounted model was preferred over the magnification loupe due to high resolution and ergonomically comfortable for surgeon. Single holed white drape along with disposable plastic drape underneath was used to provide contrast background, which helps in visualization of fine threads. It is always preferred to have ophthalmic operating stool with armrest however due to unavailability of such tool, the table height was increased to surgeon's convenience. Animal was kept in lateral recumbence and animal's head was elevated using autoclaved cloth cushion/pillow.

Preoperative Medicines

Flubriprofen eye drops t.i.d. was prescribed till operation date. Tropicamide and Tobramycin were used as preoperative pupil dilator and antibiotic respectively in the form of eye drops.

Preoperative procedure and anesthesia (Figure D)

Animals were operated under general anaesthesia using combination of Diazepam (@ 0.5 mg/kg body weight) and Ketamine (@ 10 mg/kg body weight) intravenously along with retrobulbar nerve block of lignocaine. The eyeball was either fixed with 6 stay sutures or eye speculum. Study shown that although stay sutures provide maximum stabilization, eye speculum allows easy access to operative area with less injury. Eyeball was covered with drapes. Head is elevated and focus adjusted.

Operative procedure (Figure E, F)

In manual extra capsular cataract extraction (MECCE), which was standard and most popular method of lens removal in dog for many years in which, the anterior lens capsule, the lens cortex and nuclear material were extracted. The posterior lens capsule remained intact adjacent to and frequently attached to the anterior hyaloid membrane.

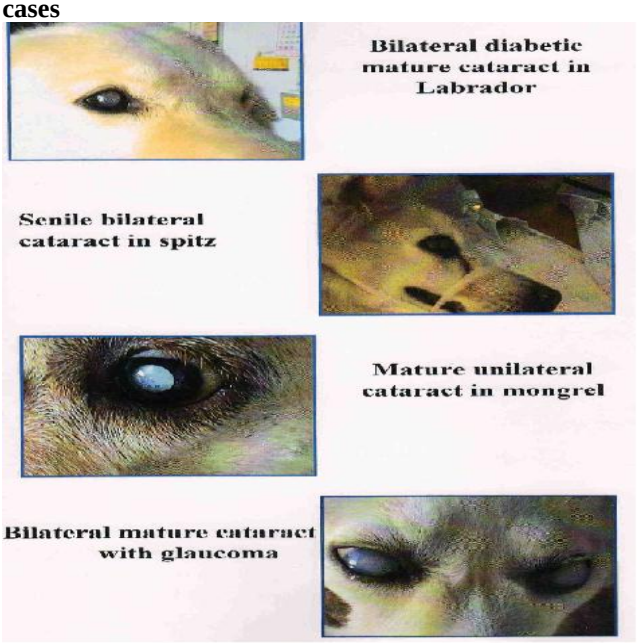
A stab incision was made through gutter on cornea at 10 O' clock position using blade no 15 and was extended with corneal scissor to 1 and 3 O'clock position. After the entry in anterior chamber, anterior chamber collapsed which was partially filled with viscomet to prevent injury to corneal epithelium. Capsule was tear with double bended 23 G needle, which was passed horizontally and then twisted to 90º to perform slow capsulorrhexis and casulotomy. In this procedure, the capsule was tear at weaker equatorial region of lens. After removal of anterior capsule, the cortical and nuclear material of lens was removed without disturbing

posterior lens capsule with the use of a small lens loupe and a muscle hook. The pressure from muscle hook was increased, moving the lenticular material from anterior chamber upward over the lens loupe. Then extra capsular lens material was extracted out. Gentle irrigation of anterior chamber was performed using of autoclaved BSS. Interrupted suturing was done with Silk 10-0 for corneal incision closure. Silk 2-0 for lid closure.

Postoperative Management (Figure G)

Postoperatively owners were recommended to follow schedule of dosage and check up strictly and prescribed with Flubriprofen for initial one-month t.i.d or q.i.d Tobramicin, Ciprofloxacin ointment, Atropine ointment for cataract-operated dogs.

Fig 1. A, B-Clinical presentation of cataract in canine cases



B

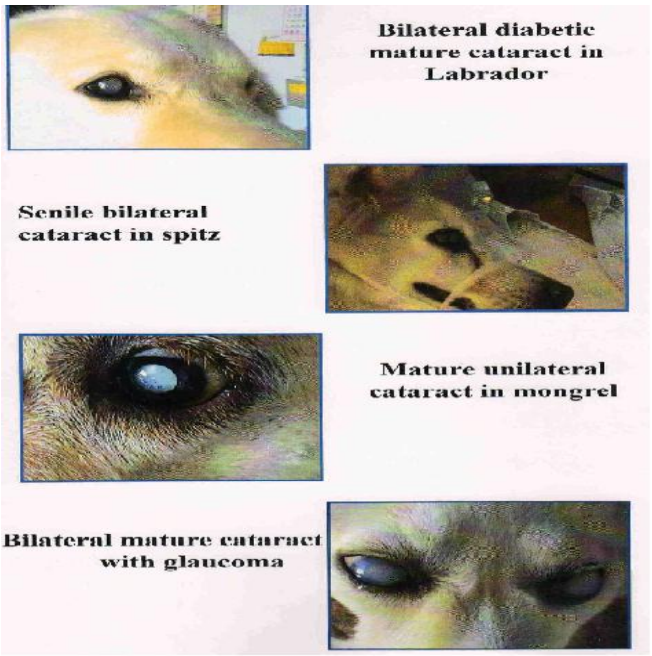


Fig 2. C- Tools used examination and operation of cataract in canine cases

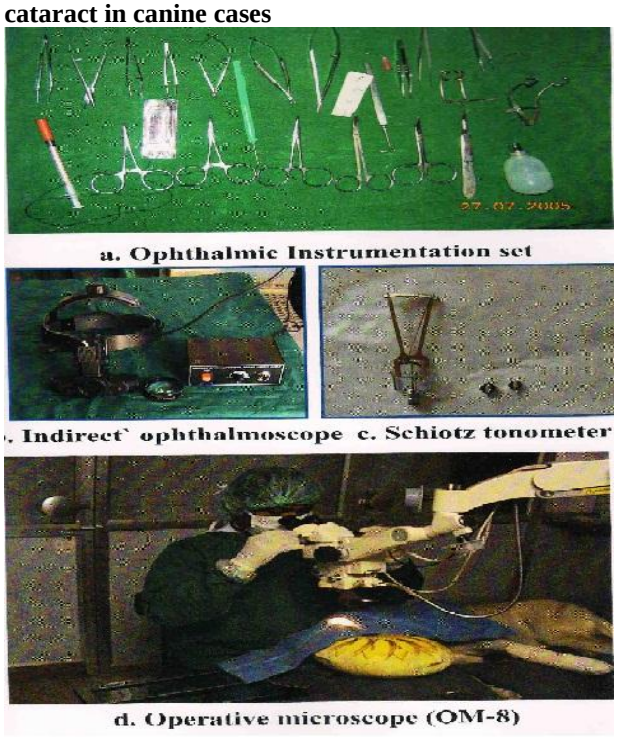


Fig 3. D – Preoperative steps for cataract surgery in canine

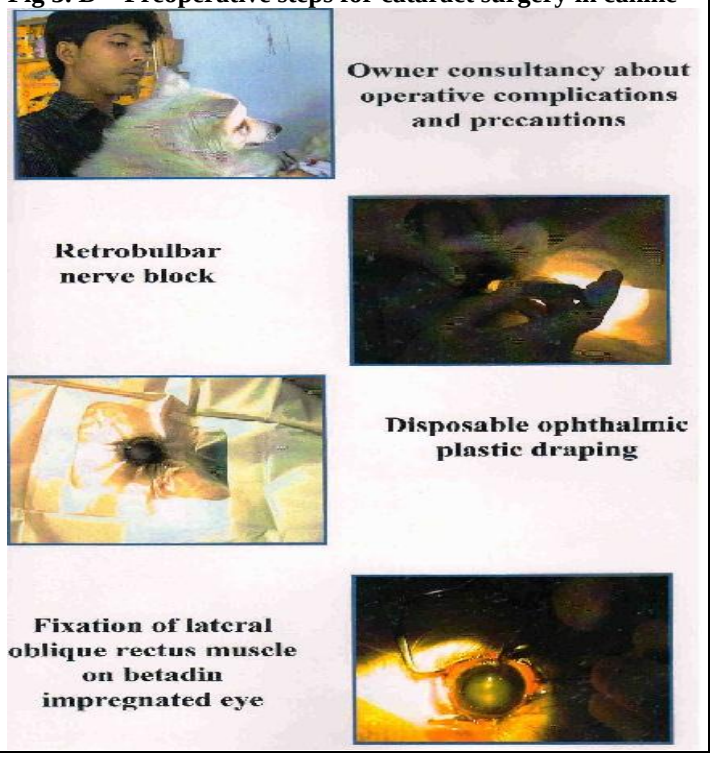
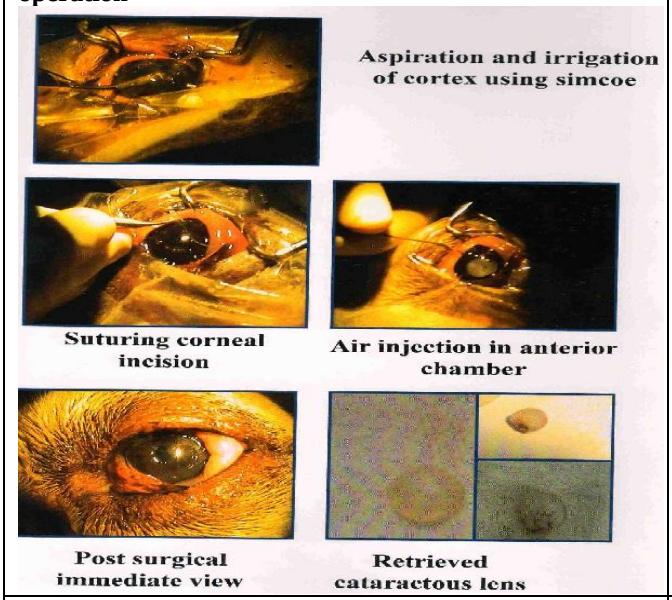


Fig 4. E and F – Algorithmic steps to perform cataract operation



F

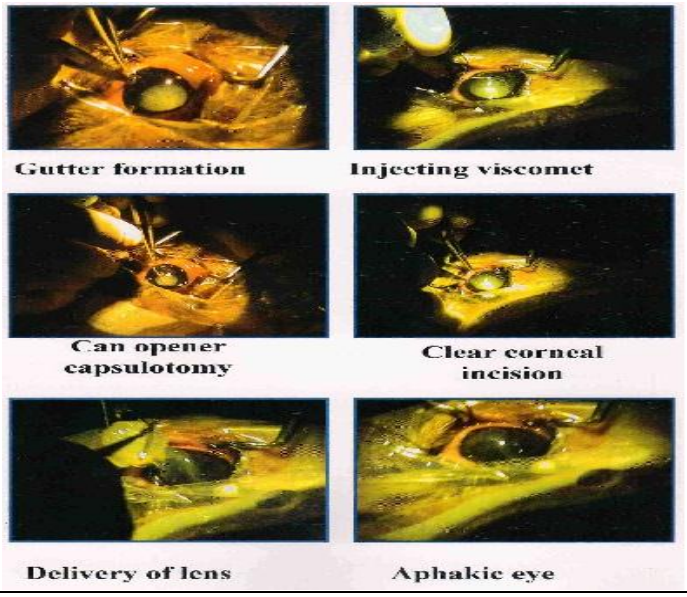


Fig 5. G – Postoperative management

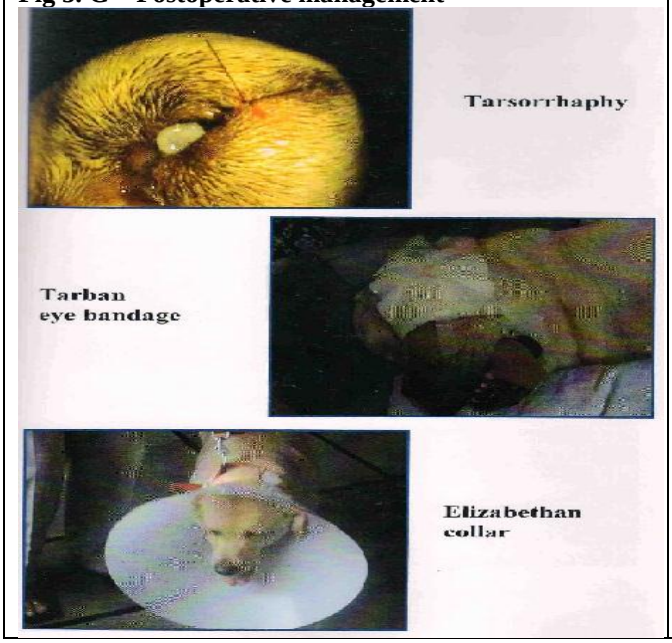
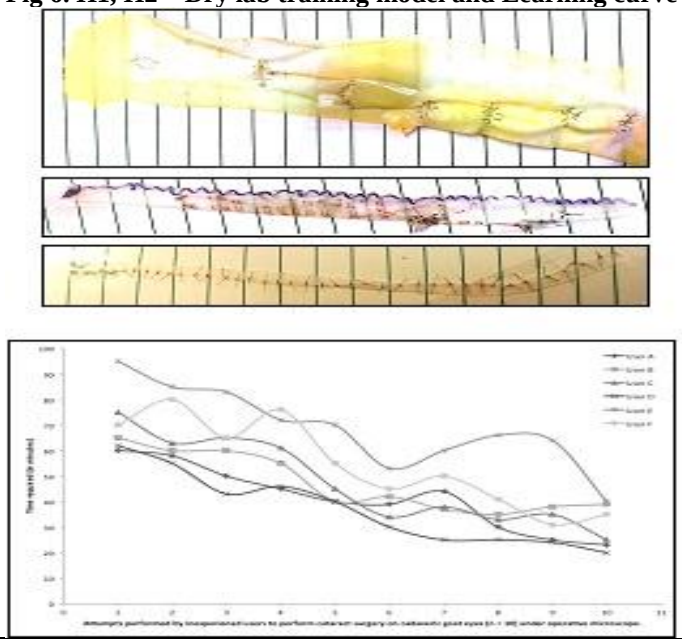


Fig 6. H1, H2 – Dry lab training model and Learning curve



DISCUSSION AND CONCLUSION

Wet lab models shown that learning curve for cataract surgery is small (Figure H2) in surgeons with prior practice on dry models. Dogs benefited from cataract surgery because it allowed them to be able to move around without the fear of bumping on objects. Similar to humans, the loss of the lens causes a loss of visual sharpness; dogs may not have completely normal vision after surgery, but regain some vision without lens. Canines can see slightly larger and only partially focused images. Although pets don't hunt, drive, play golf or tennis as in humans, most dogs will have enough vision to tackle obstacle, boost confidence and avoid life-threatening accidents (head injuries).

Most dogs will see much better when an artificial lens (IOL - 41D) is implanted inside the lens capsule. MECCE is also an alternative to owners which can't afford lens cost and would like to resolve vision loss in their pet. Categorization of cataract cases and choosing surgeries accordingly can increase success rate of surgical procedure.

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