E-ISSN:2456-3110

Review Article

Pterygium

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Journal of Ayurveda and Integrated Medical Sciences

2025 Volume 10 Number 9 September

Publisher

Maharshi Charaka Ayurveda

www.maharshicharaka.in

A Review Article on Arma in Shalakya Tantra with correlation to Pterygium

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DOI:10.21760/jaims.10.9.9

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Arma is a Mamsal Vruddhi (painless, fleshy growth) that may originate from the inner or outer canthus (Kaneenika or Apanga Sandhi), and gradually encroaching towards the cornea (Krishna Mandal). In Ayurveda Sushruta Uttar Tantra Arma is described under Shuklagata Netra Roga. Taking the modern aspect in view, it is compared to Pterygium which is defined as wing -shaped fold of fibrovascular tissue arising from the inner palpebral conjunctiva and encroaching on to the cornea usually nasal in location thereby may cause disturbance in vision. Treatment is based more on patient symptoms than corneal appearance. Review of Ayurvedic Literature and their corresponding commentaries have undergone in- depth.

Keywords: Arma, Shuklagata Netraroga, Pterygium, Krishna Mandal

Corresponding Author	How to Cite this Article	To Browse
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Manuscript Received	Review Round 1	Review Round 2	Review Round 3	Accepted
2025-07-16	2025-07-27	2025-08-07	2025-08-18	2025-08-27

Conflict of Interest	Funding	Ethical Approval	Plagiarism X-checker	Note
None	Nil	Not required	10.16	

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Introduction

Netra is one of the most important *Gynanendriyas* explained in classics. The most significant and attractive of the five sense organs are the eyes. It is quite difficult to conceive a world without eyesight for people. *Acharya Sushruta* and *Vaghbhatta* has discussed *Arma* under *Shuklagata Netra Roga*. *Arma* is a *Mamsal Vruddhi* originating from *Shleshmak Kala Bhag* (conjunctiva). It can eventually reach the cornea (*Krishna Mandal).* Pterygium doesn't result in major health issues but if this layer covers the transparent area, it hampers the vision. *Ru Dhatu* and *Manin Pratyaya Arman* are the ancestors of *Arma*. *Shyati Gacchati Iti Arma* - that which develops gradually.**[1]**

The word "pterygium" comes from Greek word "*pterygion,*" which refers to growth pattern that resembles little wing. It is Pterygium is more comm. found in people residing disease in which wing like growth is gradually tropical & subtropical area.

***Arma* (Pterygium)**

***Nidana*/Etiology**

Abnormal sleeping habits, immersing in cold water immediately after getting exposed to heat/sun, sweating, exposure to dust, smokes, etc. are some of the factors described in the common aetiology of *Netra Rogas.* Additionally, it is claimed that dietary elements like *"Shukta, Aarnala*, and *Masadi,*" or an excessive consumption of sour and meat-related substances, contributed to the development of pathogenesis and may have an impact on the weak region of the eye.

According to modern concept etiology of pterygium is not known exactly. It is considered age related degenerative condition of conjunctiva, commonly seen in people who are more exposed to dust, wind, UV light, smoke, pollen etc. More common in people living in hot climates. In Ayurvedic texts no specific *Nidana* is mentioned for *Arma Roga*, but general causative factors of eye diseases are given in elaborative manner & are to be taken as causative factors of *Arma* also. These include *Aharaj* (dietary), regimental, & *Viharaj* causes which are specifically *Achakshushya* & *Pittanusari*. *Doorekshanata* (distant gazing for long time), *Sukshma Nireekshana* that is *Kriya-Atiyoga* resulting in reduced blinking & expose ocular surface more which is predisposing factor of *Arma*, *Raja-Dhoom Nisevana*, *Abhighata* in form of thermal burns are the strongest risk factor for *Arma* causes degenerative changes in layer of sclera and conjunctiva due to increased ocular surface exposure in upgaze. *Vega Vinigraha* and *Swapna Viparayayta* is an outcome of modern occupational environment.**[2]**

Prevalence

The prevalence of pterygium is reported to be 3% in Australians, 15% in Tibetans and 7% in Singaporean Chinese and Indians. A meta-analysis published in Opthalmology (2013) covering 20 studies, over 900,000 people globally reported an overall pooled prevalence of 12%. In India, regional studies report prevalence from 5% to 15%, higher in rural, outdoor-working populations.**[3]**

Pathology

Etiologies mentioned above, lead to the vitiation of *Dosha*, which then moves upward in the head and reaches the weakly functioning part of the eye, where vitiation of *Dosha-Dushya* (*Vata-Pitta-Kapha Rakta*) takes place and clinical manifestation emerges. *Arma* (*Shukla Arma*) is developed due to vitiation of *Kapha* entity and seen on *Shukla* [white part of eye] and is considered difficult to treat.

According to modern, pathologically pterygium is a degenerative and hyperplastic condition of conjunctiva. The subconjunctival tissue undergoes elastotic degeneration and proliferates as vascularised granulation tissue under the epithelium, which ultimately encroaches the cornea. The corneal epithelium, Bowman's layer and superficial stroma are destroyed.

Signs and Symptoms

Pterygium, a triangular or wedge-shaped growth that begins on the conjunctiva of the eye and spreads into the cornea. Usually on nasal side, but may also be temporally present.

Asymptomatic in early stages, may cause irritation and foreign body sensation sometimes. Defective vision and diplopia may occur in later stages when it encroaches cornea. Common in people aged between 20 and 40 years of aged, more common in males than females. A fully developed Pterygium consist of the following parts.

- Head: Apical part present on cornea.
- Neck: Constricted part present on limbus.
- Body: Scleral part.

- Cap: Semilunar whitish infiltrate presents just in front of the head.

Table 1: In the *Ayurvedic Samhita*, there are five different types of *Arma*, according to the *Doshas* involved.

SN	Types Sushruta[4]	A.H.[5]	Structure	Dosha
1.	Prastari Arma	Prastharyarma	Thin, wide structure with red and blue colours mixed together that is located on the white of the eyeball i.e. Shukla	Tridosha
2.	Shulka Arma	Shuklarma	Soft, white structure that is growing slowly and uniformly on the eyeball's white portion.	Kapha Dosha
3.	Kshataj Arma or Lohita Arma	Shonitarma	Fleshy linear growth resembling red lotus in colour. Vagbhata referred to it as Rakatja Arma.	Rakta
4.	Adhiamamsa Arma	Adhimamsarma	Broad, soft, thick structure on the white portion of the eyeball that is brown in color, much like the liver.	Tridosha
5.	Snayu Arma	Snayuarma	Striped in shape, rough, and pale in color.	Tridosha

Table 2: Types according to modern review.

SN	Types	Features
1.	Progressive Pterygium	Thick, fleshy and vascular with whitish infiltrates in the cornea, in front of head of pterygium known as Fuch's spots/Islets of Vogt/Cap of pterygium.
2.	Atrophic Pterygium	Thin, atrophic, attenuated with very little vascularity. There is no cap but deposition of iron (Stocker's line) may be present just anterior to its head.

Table 3: Difference between Pterygium and Pseudopterygium.

SN	Features	Pterygium	Pseudopterygium
1.	Definition	Degenerative condition	Inflammatory condition
2.	Etiology	Ultraviolet radiation, dry, dusty, sandy weather	Chemical burns, trauma
3.	Age	Middle age and elderly people	Seen at any age
4.	Clinical course	Progressive or stationary	Stationary
5.	Site	Nasal or temporal bulbar conjunctiva in the horizontal meridian	Seen at any meridian
6.	Probe test	Probe cannot be passed under the neck of the pterygium	Probe can be passed under the neck of the pterygium as it is attached only at apex
7.	Treatment	Treatment is by surgical excision; recurrence following is surgery is seen and the incidence varies according to the method of surgical excision	Treatment is by surgical excision and recurrence is not seen

Stocker-Busaca's line: Deposition of iron in-front of the apex of the pterygium is called Stocker-Busaca's line. Pterygium is more common on nasal side compared to temporal side because of:-

A) More exposure of nasal conjunctiva to sunlight compared to temporal conjunctiva because of reflection of light rays from nasal bones.

B) Because collection of tears in medial canthus & waste products, which are carried along with tears stay in nasal side for more time there by irritating nasal conjunctiva more than temporal conjunctiva.

Diagnosis

- Inspection using torch,
- Slit lamp examination,
- Visual acuity test,
- Corneal Topography.

Differential Diagnosis

A. Pterygium has to be differentiated from.

- Pinguecula: Pinguecula appears as yellowish nodule near limbus with apex away from cornea.
- Pseudopterygium: Adhesion of a fold of scarred conjunctiva to part of peripheral cornea or sclera following inflammation.
- Ocular surface squamous neoplasia: Papilloma and OSSN have lobulated appearance with sentinel vessel.

B. Inflamed pterygium has to be differentiated from episcleritis, scleritis and phlyctenular conjunctivitis. All three present as nodular inflammation whereas pterygium will have characteristic wing shaped or triangular appearance.

Complications of pterygium

- Cystic degeneration and infection are infrequent.
- Neoplastic change to epithelioma, fibrosarcoma or malignant melanoma, may occur rarely.
- Recurrent inflammations (inflamed pterygium) causing recurrent episodes of pain, redness, etc.

Treatment

Arma should be removed because it is an aberrant growth in the *Suklamandala*. However, first attempt medication before performing surgery. As a result, clinical classification should be done as follows.

A. Lekhana Sadhya (non-surgical).
B. Chedan Sadhya (surgical).

(A) *Lekhana Sadhya Arma*[6] characteristics include: *Sukrama* (curd-like appearance), bluish (*Prastari Arma*), reddish (*Raktarma*), greyish (*Snayu Arma*), and *Tanu*.

- *Pittaj Abhishyand* treatment and *Krishnagata Rogas* treatment are helpful in
- In addition to *Lakhan Anjanas, Virechan and Nasyakarma* will remove *dosas* from the eyes, promoting a full recovery.
- *Nasya Karma*: The liquid component of curds (*Dadhi Mastu*) should be mixed with fine powders of equal amounts of *Krshna Loha, Tamra, Sankha, Pravala, Saindhav Lawana, Samudraphena, Kasisa,* and *Srotanjana*. This can be used for *Nasya karma* or applied over the *Arma*.**[9]**
- Oral medications: *Satavaryadi Churna, Maha Triphaladi Ghrta, Lohadi Guggulu, Sadanga Guggulu, Vasakadi Kwath,* and *Brhat Vasadi Kwatha.*
- *Marichadi Lepa*: Apply fine *Marich* and *Bibhitaka*

(B) *Chedan Sadhya* (Surgical) *Arma*

A. Preoperative measures

- Before performing an *Arma* excision, the patient's body must be purified by delivering purifying treatments such emesis, purgation, and nasal purging.
- *Ahara* - Patient should be given oily food and ghee before surgery.
- Position: Patient can lie down in a bed, where head is slightly in a downward position; or sit comfortably.
- *Lavana Churna Anjana/Avachurnana*: The doctor should next apply collyrium, a finely powdered salt powder, to eye to irritate *Arma*. Additionally, this will reduce *Arma's* swelling and get it ready for removal. Alternately, you could sprinkle salt into your eye.

B. Operative Procedure

- When a lump of *Arma* has been softened and made loose (bulged) by the administration of salt powder, sudation should be given to it. The eyes should be given fomentation with a cotton cloth (gauze piece) dipped in warm water.
- *Parighattana* - The *Arma* must be frequently touched or rubbed after sudation in order to activate it.
- *Chedana*/Excision of *Arma* - The *Arma* is freed up by mobilizing it and administering salt powder. These methods cause the swelling of the *Arma* to develop folds and wrinkles. Applying the *Badisha Yantra*, or hook, should be done precisely where the *Arma* begins to wrinkle. The patient is told to look in the direction of the eye's outer canthus or angle. The doctor performing the excision should be seated directly in front of the patient. The doctor should now lift the swelling *Arma* while holding it with *Muchundi*, or forceps. As an alternative, the patient is pierced exactly in front of a needle with a thread inserted.
- Positioning the eye before excision is crucial - The surgeon should keep both eyelids open and in the right position to make the procedure convenient. Otherwise, there is always a chance that doing so will hurt or cut your eyelids. When are not securely secured in place, operating on the *Arma* is challenging. Three hooks should be used to securely hold the swelling that has become loose and separated from the eyeball.
- Scalpel excision of swelling - The doctor should next cut or excise the *Arma* using a *Mandalagra shastra*, or round-headed scalpel. The *Arma* should be gradually dragged towards the inner canthus / angle of the eye and entirely excised when it separates from the white and black of the eye and other areas of the eyeball, all the while preventing harm to the angle of the eye.
- The significance of a sub-total excision - When removing the *Arma*, the doctor should take care to leave one-fourth of the fleshy portion of it on the eyeball, rather than completely removing it. He won't harm the eye or eyesight by doing this, nor will he induce any new issues. If a doctor accidentally excises the inner canthus along with the *Arma* without exercising caution, it results in hemorrhage and the development of a sinus tract in the eye. The remaining *Arma* will grow back to its full size if less of it is removed.

C. Post-Operative Care**[7]**

- *Pratisarana*: The operated part should be rubbed gently with powders of *Yavanala, Trikatu* and *Saindhava Lavana.*

- *Parisheka*: The wound should be cleaned with sterilized gauze and honey; washed with cold water and lukewarm
- *Vrana Bandhana*: Bandaging should be done after applying the honey and Ghee.
- *Sita Pradeha*: The cooling medicaments like *Satadhatu Ghrita* should be applied to head and sole of the feet.
- When applying the bandages, he should take into account the patient's strength, the season, the *dosha,* and the time of day.

Management of pain associated with excision of *Arma.*

- *Aschottana* (drops) - If there is eye pain brought on by excision of the *Arma*, the doctor should prescribe eye drops made from milk made with paste and a decoction of *Karanja, Amalaki*, and *Gunja*, to which honey has been added. Use this two times each day.
- *Pralepa* (ointment) - In addition to the before mentioned eye drops, the affected eye is covered with a paste made of liquorice, lotus flower stamens, Bermuda grass, and milk with ghee added.
- Application of *Lekhan Anjana* - If a piece of the *Arma* that had to be excised has been missed, it needs to be eliminated by scraping collyrium on it. This collyrium removes the leftover piece.

Signs of properly excised *Arma*

- *Vishuddha Varna* - Eye gets its normal colour.
- *Aklishtam Kriyasu Akshi* - Eye functions properly like closing, opening, seeing etc.
- *Gata Klamam* - Tiredness of eyes goes away.
- *Anupadravam* - The eye will not get afflicted by any complications.

Treatment according to Modern Concept

Usually, pterygium does not require & treatment unless it interferes with one’s vision or it causes severe discomfort. Eye drop or ointment containing Corticosteroids may be prescribed to reduce inflammation. Main indication for pterygium surgery is visual disturbance secondary to encroachment over pupillary area or induced astigmatism. Other indications which can be considered are, restriction in eye movements, chronic redness & foreign body sensation, & cosmetic concerns.

Surgical excision is the treatment of choice for pterygium. The various methods of pterygium excision are as follows.

- Simple pterygium excision.
- Simple pterygium excision with primary closure of the conjunctiva.
- Pterygium excision with bare sclera technique. Pterygium excision with grafting.
- Pterygium excision with free conjunctival graft.
- Pterygium excision with amniotic membrane graft.
- Pterygium excision with mucous membrane graft.
- Pterygium excision with limbal conjunctival graft.
- Pterygium excision with rotational conjunctival graft.
- Pterygium PERFECT - Pterygium Extensive Removal Followed by Extended Conjunctival Transplant.

Surgeries to prevent recurrence of pterygium

Pterygium recurrence is attributed to the fact that pterygium is due to altered limbal stem cells, which continue to proliferate resulting in recurrence. The recurrence rate is in the range of 30-50%.

It is highest with simple pterygium excision by bare sclera technique and least with limbal conjunctival grafting as in the latter method altered stem cells are replaced by normal ones.

McReynolds operation: Transplantation of the head of the pterygium under bulbar conjunctiva. This will change the direction of pterygium in which it grows thereby prevents corneal encroachment, but cosmetically it may not be acceptable.

Other Methods

A. Pterygium excision with adjunct antimetabolites.

- Thiotepa eyedrops four times daily for 6 weeks.
- Mitomycin C (0.02%) applied topically to the bare sclera during surgery.

B. Pterygium excision with beta irradiation.

C. Treatment of pterygium encroaching the pupillary area of cornea: Surgical excision of pterygium is followed by treatment of the residual opacity.

Residual corneal opacity is treated by phototherapeutic keratectomy or lamellar keratoplasty.

Pterygium cannot be removed without leaving scar on the cornea, as it involves Bowman's membrane. Any lesion, which involves Bowman's membrane will leave scar. The scar left behind depending on the density requires phototherapeutic keratectomy or lamellar keratoplasty.

Work up/Investigations for pterygium surgery: Systemic investigations such as measurement of blood pressure, blood sugar, human immunodeficiency virus (HIV), hepatitis B surface antigen (HBsAg), electrocardiography (ECG), bleeding time and clotting time.

Surgical technique of pterygium excision

- Pterygium excision is usually done under topical anaesthesia with 4% Lignocaine and infiltration of anaesthesia (2% Lignocaine) into the pterygium. It can also be done under sub-Tenon's anaesthesia or peribulbar anaesthesia particularly when conjunctival graft is planned.
- After topical anaesthesia, eye is cleansed, draped and exposed using universal eye speculum.
- Head of the pterygium is lifted and dissected off the cornea very.
- Main mass of pterygium is then separated from the sclera underneath and the conjunctiva superficially.
- Pterygium tissue is then excised taking care not to damage the underlying medial rectus muscle.
- Haemostasis is achieved and the episcleral tissue exposed is cauterised thoroughly.
- Conjunctival limbal autograft (CLAU)
- Transplantation to cover the defect after pterygium excision. It is the latest and most effective technique in the management of pterygium. Use offibrin glue to stick the autograft in place reduces operating time as well as discomfort associated with the sutures. Post operative care with intensive topical steroids may be needed. Follow up should be regularly done.

Complications of pterygium surgery

Intra operative

- Bleeding from conjunctival vessels.
- Injury to surrounding structures such as corneal perforation, scleral perforation and injury to horizontal rectus muscles.

Post Operative

- Corneal opacity is usually seen following pterygium excision as it usually invades deeper than Bowman's membrane.
- Diplopia due to restriction of ocular movements because of formation of adhesions.
- Suture granuloma and cyst formation.
- Scleral thinning and necrosis particularly when antimetabolites are used.
- Recurrence of pterygium is the most common complication.

Recurrence of Pterygium

- Recurrence rate is 30-50%, Bare sclera excision has got maximum recurrence rate.
- Pterygium excision by other methods has got relatively less recurrence rates
- Pterygium excision with limbal conjunctival graft has got least recurrence rate.

Causes for recurrence of pterygium

Recurrence of pterygium is because of proliferation of granulation tissue, as conjunctiva is incised during excision of pterygium. Recent hypothesis for recurrence of pterygium is regarded as due to problem in stem cells, present in limbal area & because of proliferation of these stem cells pterygium recurs (i.e. why pterygium excision with limbal conjunctival grafting, which re- places these damaged stem cells has got least amount of recurrence).

Measures to prevent recurrence of pterygium

- Application of antimetabolites such as.
- Thiotepa eyedrops.
- Mitomycin C (0.02%) applied locally during surgery.
- Beta radiation.

Postoperative regimen after pterygium excision

- Milder topical steroids such as fluorometholone or dexamethasone with topical antibiotics to prevent secondary bacterial infection used four to six times for about 4 weeks (steroids have to be used carefully because of the presence of corneal epithelial defect,

Which is made by detaching/dissecting the head of the pterygium from cornea).
- Artificial tears used four to six times for about 2 weeks.

Treatment of complications (*Arma Upadrava*) [8]

Surgery can be considered as successful if patient feels comfort without any pain. If any complications like pain or discomfort is felt due to excessive or less cutting of membrane, it should be managed properly. It is mainly managed with *Sekas* and *Anjanas* which have *Lekhana* and *Brimhana* properties. If there is pain in eye after excision of *Arma*, a paste of *Karanja Beeja*, *Amla* and *Yashtimadhu*, *Siddha* by their own *Kashaya* & mixing with milk & then *Madhu Prakshepa* is used & this mixture is applied two times day in form of *Aschyotana*. These *Dravyas* are also used as *Lepa* on forehead. *Yashtimadhu, Kamalkeshar* & *Durva* are mixed to form paste & adding milk and *Ghrita* to paste. This mixture is applied on *Shiro Bhag* or *Netra* for relief of pain after excision of *Arma*.

Prevention
- Avoid exposure to environmental factors like pollen, smoke, dust etc.
- Use of sunglasses and hat to shield eye from UV rays.

Prevention of recurrence[9]

If there is *Heena Chedana* i.e., *Arma-Shesha*, *Lekhan Dravyas* should be applied.

Features of well-*Chedya Arma*

When there is proper *Chedana* of *Arma* has been done following features are seen:

1. The eye ball appears to be clean and clear i.e., *Vishuddha Varna* of eye occurs.

2. The eye executes its movements normally. Eye becomes free in its movements and functions like *Sankocha, Prasara* and *Avalokana* can perform without any discomfort.

3. Complications like *Manya Shool*, *Netra Shool*, inflammation (*Shotha*), suppuration (*Paka*) etc does not occur.

Ati- Chedana

If *Arma* is excised out more than required amount bleeding, fistula formation, lacrimation etc. Can take place.

Heena- Chedana

If excision is less than the required amount then recurrence of *Arma* can take place. In such cases the residual part of *Arma* should be treated by *Lekhya Anjan*.

Shukra Chikitsa* in *Arma

Acharya Vagbhat has mentioned *Shukra Chikitsa* in *Arma*. The *Arma* which is short and coloured like that of curd/white/blue/red/grey and thin layered is treated like that of *Shukra*. Those patients who are undergone surgery should apply appropriate *Anjanas* for at least one year for the prevention of further development of the *Arma*.

***Aushadhi Yogas* or *Anjanas* explained in different classics**

1. Shankhadi Anjana
2. Shilanjana
3. Shuklari Varti
4. Sitadi Anjana
5. Dakshnadi Anjana
6. Nayan Sukha Varti
7. Prabhavati Gutika
8. Gutikanjana
9. Guduchydi Anjana
10. Chandanadi Choornanjana
11. Tamraddi Anjanam
12. Tutthadi Varti
13. Marichyadi Lepa
14. Manjisthadi Anjana
15. Manashil Anjana

Conclusion

In *Ayurvedic* classics, *Arma* is described under *Shuklagata Netra Roga*, is a *Chedana Sadhya Vyadhi*. Our *Acharyas* have described *Aushadha Chikitsa* i.e., *Shukravat Chikitsa* in the form of *Lekhana Anjana, Seka, Lepa, Pratisarana etc* for *Arma*. Clinical features and management of *Arma* simulates that of Pterygium in modern science. Conjunctiva is the most superficial layer of the eyeball and hence utmost care and all precautionary measures should be taken to avoid its degeneration. *Vata* is the main causative factor for degeneration. That is why regular *Padabhyanga*, intake of *Ghrita, Shiroabhyanga* has to be advocated in every individual who are under risk factors.

A pterygium is a benign, fleshy triangle of tissue that typically develops in the inner corner of the eye. A pterygium will not usually cause serious health complications. However, it can sometimes cause discomfort and problems with vision. Prevention, conservative treatment or sometimes surgery is advised for treatment of pterygium.

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