

SURGICAL AND PARA-SURGICAL TECHNIQUES FOR CORRECTION OF TRICHIASIS AND ENTROPION: UNDER-RECOGNIZED CONTRIBUTION OF ANCIENT INDIA

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Abstract: Despite the fact that India has had a long tradition of ophthalmic surgical practices, her contribution in the field remains largely unrecognized by the world. Sushruta (1000-800 BC), the father of Indian surgery, lived much before Hippocrates (460-370 BC) and Galen (129-216 AD), and described various ophthalmic surgeries, including surgeries for trichiasis, distichiasis, and entropion in his treatise *Sushruta Samhita*. Sushruta and subsequent authorities on the subject also advocated para-surgical procedures such as chemical and heat cautery apart from surgeries. Their surgical techniques were practiced all over India for more than 3000 years. It is very likely that their surgical knowledge spread even beyond the boundaries of the Indian subcontinent and benefited the world at large including the Arab and Europe. Here we describe the techniques of surgical and para-surgical procedures for trichiasis, distichiasis, and entropion practiced in India until recent past before it was replaced by modern procedures at large.

Keywords: Agni Karma; Entropion; Kshara Karma; Pakshmakopa; Sushruta; Trichiasis

INTRODUCTION

India has had a long tradition of ophthalmic practices beginning even before the legendary Nimi through Sushruta, Nagarjuna of third century BC, and Vagbhata of second century AD and so on up to pre-modern times. Indian knowledge and practices of ophthalmology, however, remained largely unrecognized by the western world more because of political reasons than the lack of awareness about ancient Indian medical tradition. Modern medicine has witnessed the great strides of development in last two centuries. It is widely recognized that the modern medicine is built on the foundations laid by the Greeks and the Romans. But little is known about the contribution of Indian Medicine in the development of the ancient Greek and Roman Medicine systems. We find marked resemblance between the ophthalmic procedures carried out by the Indian and Greek surgeons respectively. The similarities in details of these procedures are so striking that they cannot be attributed to mere chance ignoring the possibility of exchange of ideas. There must be exchange of knowledge during foreign invasions and expeditions (Alexander-326 BC) [1] to India. Probably the Greeks and Romans learnt the

surgical procedures from Sushruta (1000-800 BC) [2], who lived much earlier than Hippocrates (460-370 BC) [3] and Galen (129-216 AD) [3]. We describe here an eyelid condition that includes the conditions of trichiasis, entropion and distichiasis, and was known as *Pakshmakopa* in the times of Sushruta. It will enable us to appreciate and recognize the nature of the techniques of surgical and para-surgical procedures, the material used and the outcome.

Trichiasis and entropion are common lid diseases known to the surgeons since antiquity. Trichiasis is characterized by misdirected eyelashes that grow inward towards the eyeball [4] where as entropion is inwards turning of eyelid margin leading to rubbing of eyelashes against the cornea [5]. Distichiasis is an extra row of eyelashes emerging from the ducts of meibomian glands [6]. Trichiasis is caused by infection, inflammation, autoimmune conditions, congenital defects, eyelid agenesis or trauma. Entropion may be congenital, age-related, or the result of infection, inflammation or trauma. The most common infectious cause of these eyelid conditions is trachoma which may result in blindness by conjunctival scarring [7] [8].

There is substantial evidence that trachoma was endemic in ancient world [6] including India. It is obvious that trichiasis and entropion may have been prevalent in India too due to widespread occurrence of trachoma.

PAKSHAMAKOPA (TRICHIASIS, DISTICHIASIS AND ENTROPION)

Sushruta describes *Pakshmakopa* in the chapters dealing with eyelid diseases (*Vartmagata Roga*), and their management [9] (Uttara tantra chapter 3, chapter 16). He writes that in this disease eyelashes become sharp, rough and misdirected, and turn inwards causing injury to eyeball; that continuous injury results in ocular pain due to intolerance to wind, sunlight and heat [9] (Uttara tantra chapter 3/29-30).

Vagbhata terms *Pakshmakopa* as *Pakshmoparodha* which literally means hampering by eyelashes. He describes *Pakshmoparodha* as an affliction causing contraction of eyelid margin and misdirection of eyelashes eventually resulting in eyeball injury due to rough and sharp eyelash-tips. He also includes a condition of an extra row of eyelashes in his definition of *Pakshamoprodha*. The eyelashes are obviously directed inwards causing eyeball injury, inflammation, burning and foreign body sensation, and intolerance to wind, light and heat [11] (Uttara tantra chapter 11/24). Dalhana, the commentator of *Sushruta Samhita*, calls the state of an extra row of eye lashes *Upapakshmamala* [9] (Dalhana commentary on Uttara tantra chapter 3/29-30). In fact, the terms *Pakshmakopa*, *Pakshmoparodha* and *Upapakshmamala* have been used interchangeably to describe trichiasis, entropion and distichiasis. Sushruta and subsequent authorities consider *Pakshmakopa* as a disease caused by vitiation of all three *doshas* [9] (Uttara tantra chapter 1/39).

MANAGEMENT OF PAKSHAMAKOPA

Various methods of *Pakshmakopa* treatment were prevalent even before Sushruta. However, the direct records of practices prevalent before Sushruta are not available today. The management of *Pakshmakopa* by Sushruta reflects the management practices prevalent at that time. Sushruta and subsequent authorities described following treatment procedures for the management of *Pakshmakopa*.

1. Epilation of eyelashes
2. Eyelid margin everting surgery
3. *Kshara Karma* (cauterization by caustics)
4. *Agni Karma* (cauterization by heat)
5. Excision of anterior eyelid margin along with lash-follicles

Epilation of eyelashes

Both Sushruta [9] (Uttara tantra chapter 3/29-30) and Vagbhata [11] (Uttara tantra chapter 11/24) recommend repeated epilation of misdirected eyelashes as a temporary measure to relieve symptoms and prevent any further *Pakshmakopa* related corneal injury. This method is still widely employed as an initial treatment for trichiasis, distichiasis and entropion.

Eyelid margin everting surgery

Sushruta describes the surgical procedure as follows:

“The procedure should be performed on a person (patient) who is well oiled and prepared by preoperative purification methods and who is seated comfortably. The procedure should be performed by excising an elliptical strip of eyelid tissue equal in thickness of a barley grain, horizontally near the roots of eyelashes, away from eyebrows and centered at equal distance from canthi. The wound, then, should be closed by suturing with a hair (a horse-tail hair was usually used for that purpose and both ends of the sutures were left free) and the ends of suture fixed to the forehead with the help of a bandage. A mixture of honey and clarified butter (*ghee*) should be applied as wound dressing. The sutures should be removed carefully after the wound has stabilized properly” [9] (Uttara tantra chapter 16/3-6), [11] (Uttara tantra chapter 12/14) (**Figure 1**).

It is pertinent to mention here that Sushruta did not know the layer-wise anatomy of eyelid as it is known today. But it seems that he knew by experience how much tissue should be removed to evert the eyelid margin adequately for correction of trichiasis or entropion. We know now that mere excision of skin seldom cures entropion or trichiasis. Therefore, it can be inferred that Sushruta used to excise not only skin but also deeper tissues including orbicularis oculi muscle and may be a strip of tarsal plate too.

The tarsal wedge resection or Snellen's operation seems very similar to Sushruta's procedure practiced in ancient India.

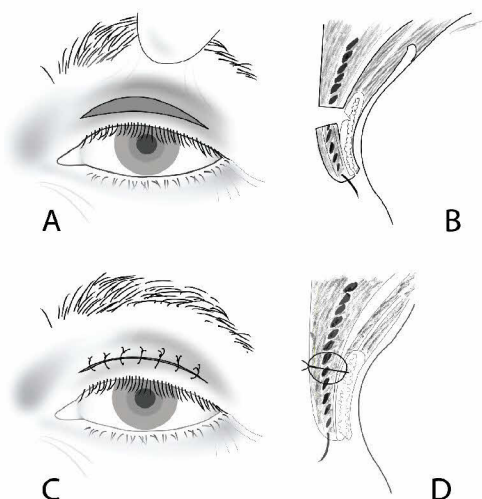


Figure 1: Excision of an elliptical strip of eyelid tissue equal in thickness of a barley grain horizontally, near the roots of eyelashes, away from eyebrows and centred at equal distance from canthi. A. Anterior view of eyelid incision, B. Sagittal section of eyelid incision, C. Anterior view of wound Closure, D. Sagittal view of wound closer

Kshara Karma (cauterization by caustics)

Kshara used to be an important part of surgical armamentarium in the operation theatres of ancient Indian surgeons. While describing the properties and use of *Kshara* Sushruta says, “*Kshara* is used as one of the chief instruments to chemically cut, scrap or pierce the lesion when applied in a particular manner. It penetrates the deeper tissues and excises, burns, digests and cleans the diseased site, and therefore, helps in wound healing” [9] (Sutra sthana chapter 11/3-5). Sushruta treated a number of surgical lesions, including trichiasis and entropion, by topical application of strong *Ksharas*. *Ksharas* are special formulations prepared by dissolving the ash of medicinal plants in water, then heating to make it thicker in consistency, and finally adding fine powder of some other medicinal plants to it [9] (Sutra sthana chapter 11/11-13). Depending upon their strength and frequency of their use, the *Ksharas* have various topical uses such as in debriding the wound [9] (Chikitsa sthana chapter 1/88), cutting the pedunculated lesions slowly as in the case of haemorrhoids [9] (Chikitsa sthana chapter 6/4), destroying skin lesions such as warts and hair follicles [9] (Chikitsa sthana chapter 21/53), and altering the tissue strength and shape by producing scar etc.

Sushruta recommends the topical application (*pratisarana*) of *Kshara* [9] (Uttara tantra chapter 16/7) in order to destroy eyelash follicles in case of misdirected eyelashes, and to produce controlled contraction of external eyelid lamina in order to evert the eyelid margin in case of entropion.

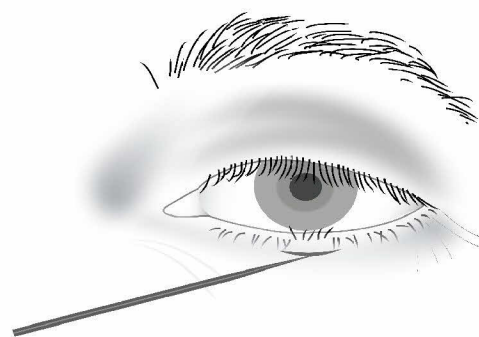


Figure 2: A shallow incision on affected eyelid margin followed by application of *Kshara* or *Agni* to treat lower eyelid entropion.

Sushruta’s procedure of Kshara application

Sushruta used to make his patients sit comfortably in a spacious room away from direct sunlight and wind. With all equipments kept ready he used to clean the eyelid, scrub and paint the skin with decoctions. He used to make shallow, intermittent, horizontal incisions (*Prachchhanna*) along the lid-margin, a short distance away from the inverted lashes (*doshopahata vali*) [9] (Sutra sthana chapter 11/18) (**Figure 2**).

He then used to apply *Kshara* over these incisions for a period of 100 *vak matras* (approximately 30 seconds). After that he used to remove *Kshara* and wash the site with decoction of mild acidic drugs such as diluted lemon juice, and apply a dressing of paste of sesamum seeds (*Sesamum indicum*), clarified butter and honey to relieve pain and burning sensation. He probably repeated the procedure in case of recurrence and under-correction.

Agni Karma (Cauterization by heat)

Sushruta also recommends *Agni Karma* [9] (Uttara tantra chapter 16/7) (heat cautery) for the treatment of trichiasis and entropion. In certain situations, he considers *Agni Karma* as a better alternative than surgery [9] (Sutra sthana chapter 12/3).

Procedure for Agni Karma

Sushruta recommends the carrying out the procedure of *Agni Karma* on a patient seated comfortably with his eyeball covered and protected with wet cotton cloth [9] (Sutra sthana chapter 12/9)

The procedure involves application of red-hot needle (*suchi yantra*) from skin side at the

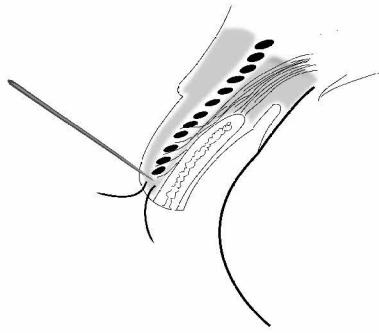


Figure 3: Agni karma by applying red-hot *suchi* (needle) at the base of misdirected eyelashes in case of Trichiasis.

base of eyelashes in such a way that it burns the eyelash follicles [11] (Uttara tantra chapter 12/14) (Figure 3).

All of the follicles with abnormal eyelashes get destroyed by repeated application of red-hot needle. Probably *Agni Karma* was also done in a way similar to *Kshara Karma* by giving a small skin incision and application of heat cautery directly on subcutaneous tissue and orbicularis oculi muscle (Figure 2). After proper heat cautery, he used to apply the paste of drugs having soothing properties such as *chandana* (*Santalum album*), *manjistha* (*Rubia cordifolia*), *yastimadhu* (*Glycyrrhiza glabra*) etc. mixed with clarified butter and honey for wound care [9] (Sutra sthana chapter 12/27-28).

Mechanism of *Kshara* and *Agni Karma*

It seems that the application of *Kshara* or *Agni Karma* served the following purposes:

- a. Destruction of lash follicles to overcome the need of repeated epilation;
- b. Creation of adhesions between orbicularis oculi muscle and the tissue around to reduce the overriding of the orbital part of orbicularis muscle on the pretarsal part of orbicularis muscle resulting in improvement or correction of entropion.

Excision of anterior lid margin

The authorities also recommend the total excision of anterior eyelid margin as a last resort. The procedure involves holding of eyelids with the help of three hooks and excision of whole of the lid margin bearing eyelashes.

The paste of *haritaki* (*Terminalia chebula*) and *tuivraka* (*Hydnocarpus laurifolia*) is then applied on the wound [9] (Uttara tantra chapter 16/8).

CONCLUSION

The Indian tradition of surgical practice can be traced back to at least 1000 years before Christ when Sushruta lived, practiced and trained his disciples in the surgical field. The above description enables the reader to appreciate the exact nature of surgical techniques, material used and outcome of the procedures carried out for the management of trichiasis, entropion and distichiasis. This paper presents an authentic interpretation of Sanskrit texts for global readership in English language.

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