



Role of Kshara Sutra Therapy in The Management of Nadi Varna (Pilonidal Sinus): Evidence-Based Review

Dr. Ravinder Singh Khattria

Professor, Department of Shalya Tantra, Shaheed Kartar Singh Sarabha Ayurvedic Medical College and Hospital, Sarabha, Ludhiana, Punjab, India.

ABSTRACT: *Nadi Vrana*, a chronic and deep-seated sinus condition characterized by pus discharge and tract formation, closely resembles modern clinical conditions like fistula-in-ano and pilonidal sinus. In *Ayurveda*, the treatment of such disorders is described in detail, with KST emerging as a highly effective, minimally invasive and scientifically validated technique. This review aims to explore the role of KST in managing *Nadi Vrana*, highlighting its principles, pharmacological basis, clinical effectiveness and integration into modern surgical practice. Several clinical studies and randomized trials have demonstrated its superiority over conventional surgical interventions in terms of recurrence rate, patient comfort and postoperative recovery. The review also discusses contributions from the Central Council for Research in Ayurvedic Sciences and the scope of integrating this traditional technique into modern evidence-based medicine. Despite challenges in standardization and global acceptance, KST remains a promising and sustainable approach for managing chronic sinus conditions like *Nadi Vrana*.

KEYWORDS: Pilonidal Sinus, Nadi Vrana, Kshara Sutra, Minimal Invasive Therapy

INTRODUCTION

Pilonidal sinus (PNS) is a chronic inflammatory condition characterized by the formation of a sinus tract, often occurring in the sacrococcygeal region. It is commonly associated with pain, swelling and recurrent infections, significantly affecting the quality of life. Conventional treatment options, including surgical excision and minimally invasive procedures, are often associated with high recurrence rates and prolonged healing times. Thus, there is a growing interest in alternative and traditional treatment modalities that offer effective management with fewer complications. In *Ayurveda*, PNS is correlated with *Nadi Vrana*, a condition described in classical texts as a chronic, tunneling wound associated with vitiated *doshas*, particularly *Vata* and *Pitta*¹. The term *Nadi* refers to a tunnel or tube-like structure and *Nadi Vrana* is considered a type of sinus². A sinus is a blind tract lined with granulation tissue or epithelium. Pilonidal sinus closely resembles *Shalyaja Nadi* as described in *Ayurveda*. The term "pilonidal" originates from the Latin words *pilus* (hair) and *nidus* (nest), indicating its association with hair accumulation. It is a benign condition commonly seen in young adults between the ages of 15 and 30, typically after puberty, when sex hormones influence the pilosebaceous glands and alter hair growth patterns. The PNS manifests as a short tract originating from an opening in the skin near the natal cleft or intergluteal region, often containing hair and frequently presenting in individuals in their third decade of life². Various treatment approaches have been developed in modern medical science for its management.

According to Ayurveda, the causative factors (*Nidana*) for *Nadi Vrana* include³:

- Excessive physical exertion
- Consumption of incompatible or vitiating food (*Viruddha Ahara*)
- Suppression of natural urges (*Vegadharana*)
- Trauma, chronic infections, or residual pus
- Improper drainage or incomplete healing of abscesses

These causative factors lead to the vitiation of *doshas*—especially *Pitta* and *Kapha*, resulting in tissue degeneration, accumulation of pus and sinus formation. The pathogenesis (*Samprapti*) involves the lodging of vitiated *doshas* in *mamsa dhatu* (muscle tissue) and *sira* (channels), creating a pathway that ultimately forms the sinus tract.

Among the various *Ayurvedic* treatment modalities, *Ksharasutra* therapy (*KST*) has emerged as an effective, minimally invasive approach for the management of sinus tracts. With the growing acceptance of integrative medicine, *KST* offers a promising alternative to surgical interventions, particularly in cases where recurrence, patient compliance, and non-invasive treatment options are key concerns⁴. The ideal treatment approach would ensure a swift recovery, allowing patients to return to their daily activities with minimal morbidity and a low risk of complications. The fundamental principles of management include complete removal of the sinus tract, effective healing of the surrounding skin and prevention of recurrence. If not properly managed in the initial stages, it can lead to significant complications and a high recurrence rate. Over the past few decades, *KST* has undergone clinical scrutiny and validation through several randomized controlled trials and observational studies. Its low recurrence rates, cost-effectiveness, outpatient feasibility and reduced complications have been widely appreciated. It has now found a place in integrative healthcare and is increasingly being promoted under India's AYUSH systems for chronic wound and sinus management.

This review aims to analyze the efficacy, safety and evidence-based outcomes of *KST* in the management of PNS. By examining clinical studies, comparative analyses and traditional *Ayurvedic* perspectives, this paper seeks to highlight the advantages and limitations of *KST* in reducing recurrence rates, promoting wound healing and improving patient outcomes. It seeks to bridge the gap between traditional *Ayurvedic* wisdom and modern clinical practice, offering an evidence-based perspective on this promising therapeutic modality.

MATERIALS AND METHODS

This study is an evidence-based review focusing on the role of *KST* in the management of *Nadi Vrana*. The review includes an in-depth analysis of classical *Ayurvedic* texts, modern clinical studies, case reports and comparative evaluations of *KST* versus conventional surgical treatments.

Etiology of *Nadi Vrana*

The exact cause of *Nadi Vrana* is not completely understood, but it is believed to be a combination of mechanical, anatomical and hormonal factors. The condition primarily affects young adults and is more common in males. The key factors contributing to its development are:

- The term *Pilonidal* means "nest of hair," indicating that loose hairs penetrate the skin and cause inflammation. Hair shafts, particularly in the natal cleft (intergluteal region), get embedded into the skin due to friction and movement. These hairs act as foreign bodies, leading to an inflammatory reaction and sinus formation⁵.
- It predominantly occurs in post-pubertal males (15-30 years old) due to the influence of androgenic hormones on hair growth and sebaceous glands. Increased hair density and excessive sebum secretion contribute to clogging of follicles, leading to sinus formation⁵.
- Prolonged sitting, especially in occupations like driving and desk jobs, increases pressure on the sacrococcygeal region. Friction between the buttocks creates an environment where hair shafts penetrate

the skin. Repeated microtrauma from activities like cycling or prolonged sitting causes hair and debris to enter the skin, leading to inflammation⁵.

Types of Nadi Vrana

Nadi Vrana (sinus tract) is described as a chronic pus-discharging wound that resembles a tunnel or fistula. *Acharya Sushruta* categorizes *Nadi Vrana* based on its etiology (causative factors), *doshic* involvement and clinical presentation⁶.

Based on *Doshic* involvement, *Nadi Vrana* is classified based on the predominance of the three Doshas (Vata, Pitta, and Kapha):

- 1) *Vataja Nadi Vrana* (Dominated by Vata Dosha)
- 2) *Pittaja Nadi Vrana* (Dominated by Pitta Dosha)
- 3) *Kaphaja Nadi Vrana* (Dominated by Kapha Dosha)
- 4) *Sannipataja Nadi Vrana* (Tridoshic Involvement)

Acharya Sushruta also classifies *Nadi Vrana* based on causative factors, which can be correlated with different types of sinus formations in modern medicine⁷:

- 1) *Agantuj Nadi Vrana* (Traumatic Sinus)
- 2) *Shalyaja Nadi Vrana* (Foreign Body-Induced Sinus)
- 3) *Kusthaja Nadi Vrana* (Caused by Chronic Skin Disorders)
- 4) *Prameha Nadi Vrana* (Diabetic Sinus)

According to Ayurveda, *Nadi Vrana* is also categorized based on its prognosis:

- 1) *Sadhya Nadi Vrana* (Easily Curable)
- 2) *Kashtasadhya Nadi Vrana* (Difficult to Cure)
- 3) *Asadhya Nadi Vrana* (Incurable)

Pathogenesis of Nadi Vrana

According to *Acharya Sushruta*, *Nadi Vrana* occurs due to *vitiation* of *Vata*, *Pitta*, and *Kapha doshas*, along with the presence of a foreign body (*Shalya*). Aggravation of *Kapha-Pitta Dosha* leads to excessive hair growth, oil secretion and blockage of sweat glands. *Vata dosha* vitiation promotes sinus tract formation and delayed wound healing⁸. Hair and foreign particles (*Shalya*) get trapped in the natal cleft, leading to infection. Pus formation and chronic infection occur, leading to abscess development. If untreated, the sinus tract extends deeper, creating multiple openings and chronic discharge.

Ksharsutra in *Nadi Vrana*

The most effective Ayurvedic treatment for *Nadi Vrana* (Pilonidal Sinus) is *KST*, as described by *Acharya Sushruta*. It provides better healing, minimal recurrence and fewer complications compared to modern surgical interventions⁹. Several clinical studies have evaluated the efficacy of *KST* in treating anorectal disorders, particularly fistula-in-ano and hemorrhoids. A simplified visual representation of the process and action of *Ksharasutra* therapy in a sinus tract (*Nadi Vrana*) is shown in figure 1.

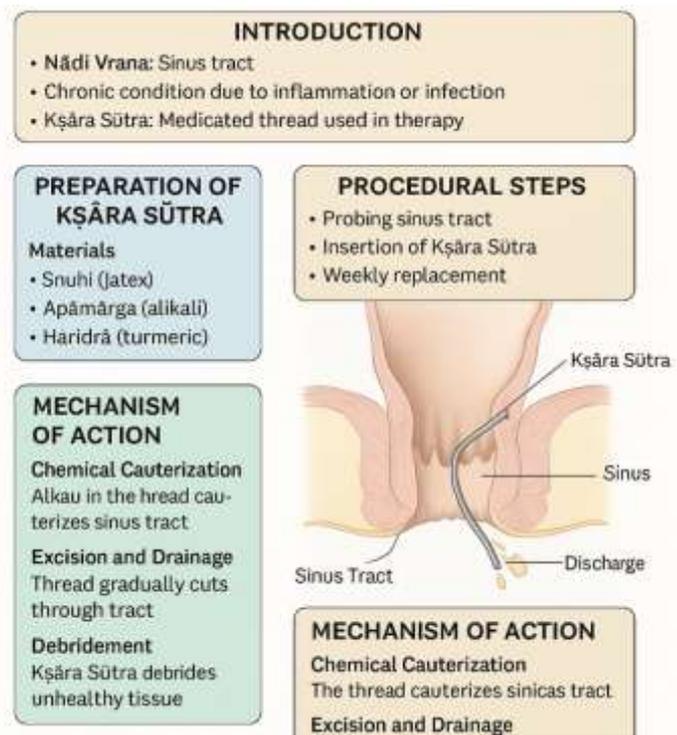


Fig.1 The process and action of Ksharasutra therapy

A case study was conducted for investigating the effectiveness of Kshar Sutra therapy as a minimally invasive treatment for Nadi Vrana¹⁰. A 33 years old male patient presented with a recurrent pilonidal sinus in the sacrococcygeal region. The patient reported undergoing Z-plasty surgery for PNS in 2005. However, the condition recurred after three years in 2008, as confirmed by a CT scan. Unwilling to undergo another surgical procedure, the patient opted for Ayurvedic treatment, and Kshar Sutra therapy was recommended as an alternative approach. The patient recovered in four weeks with minimal discomfort. There was no recurrence after follow-up for one year.

Another case study documented the treatment of a 24-year-old female patient with a recurrent PNS, experiencing pain and discharge nine months after undergoing laser surgery. As an alternative approach, Chitraka KST was performed under local anesthesia. The treatment resulted in complete healing within seven weeks, demonstrating the effectiveness of KST in managing recurrent pilonidal sinus cases. Another case study reported the successful treatment of a PNS using Palasha Kshara Sutra prepared in Arka Ksheera. The patient experienced complete healing, suggesting that this method is a viable alternative to conventional surgical procedures for pilonidal sinus management¹¹.

In KST, medicated threads coated with Ayurvedic herbs are used for treatment. The thread is inserted into the PNS and replaced with a fresh one every seven days. The complete treatment typically lasts between 4 to 8 weeks, depending on the severity of the condition. This therapy not only helps in eliminating the sinus tract but also promotes the formation of healthy new tissue, ensuring effective healing. A young male (age 26) with recurrent pilonidal sinus, presenting with pain, swelling, and purulent discharge. The patient had undergone surgical excision a year ago but experienced a recurrence. Clinical examination and imaging confirmed a sinus tract in the natal cleft region. A Kshar Sutra coated with Tilanadi Kshara (alkaline extract from sesame plant), Snuhi latex, and Haridra powder was used. Under local anesthesia, the sinus tract was probed and Tilanadi Kshara Sutra was inserted¹².

In recent years, KST has garnered growing interest in integrative medicine frameworks, where traditional and modern systems co-exist to offer holistic, patient-centered care. The therapy, once limited to *Ayurvedic*

institutions, is now being incorporated in AYUSH-integrated hospitals, government wellness centers and medical colleges as an effective approach for managing chronic sinus tracts, including *Nadi Vrana*, PNS, and anal fistulas¹³. Several national and international medical organizations have acknowledged the role of traditional interventions in complementing modern surgical treatments, especially for conditions that are prone to recurrence, require cost-effective alternatives, or demand minimal hospitalization. CCRAS (Central Council for Research in Ayurvedic Sciences) Developed Standard Operating Procedures for thread preparation ensuring uniform coating, sterility and herbal composition and issued treatment protocols for clinical application, including insertion, weekly changes and wound care¹⁴.

Challenges and Future Scope

Despite the proven efficacy and historical significance of KST in the management of *Nadi Vrana*, its widespread adoption in modern clinical practice still faces multiple hurdles. However, with focused efforts in innovation, training and interdisciplinary collaboration, there exists a vast potential to expand its role in global wound care and surgical practice.

CONCLUSIONS

The management of *Nadi Vrana*, a chronic and often recurrent condition, continues to challenge both patients and practitioners due to its complex nature and resistance to conventional treatment. In this context, KST, rooted in classical *Ayurvedic* wisdom and validated by modern clinical research, emerges as a minimally invasive, cost-effective and highly effective alternative to conventional surgical methods. By combining mechanical pressure, chemical cauterization, and antimicrobial action, *Ksharasutra* not only ensures complete tract elimination but also promotes natural, scar-free healing with a significantly reduced recurrence rate. Its outpatient applicability, compatibility with integrative healthcare models, and encouraging outcomes from evidence-based clinical studies make it a valuable addition to the armamentarium of chronic wound management strategies.

However, for KST to achieve mainstream global recognition there remains a need for greater standardization and quality control, enhanced training and capacity building, rigorous clinical research with interdisciplinary collaboration and strategic policy support and international integration.

With increasing focus on sustainable, traditional and patient-centered healthcare, KST stands as a model of timeless innovation, where ancient knowledge meets modern demands. Its role in the management of *Nadi Vrana* exemplifies the relevance and potential of Ayurveda in addressing contemporary clinical challenges through natural, holistic, and scientifically-grounded interventions.

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