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### Review Article

## **“NADI VRANA (SINUS): A COMPREHENSIVE REVIEW OF AYURVEDIC CONCEPTS, CONTEMPORARY UNDERSTANDING, AND THERAPEUTIC APPROACHES”**

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#### **ABSTRACT**

Nadi Vrana is a chronic suppurative disorder described extensively in Ayurvedic surgical literature and is considered one of the most challenging conditions under Dushta Vrana. The disease is characterized by the formation of a tubular structure associated with persistent discharge, pain, tenderness, inflammation, and delayed healing. Acharya Sushruta described Nadi Vrana as a pathological condition resulting from improperly managed Vrana Shopha, retained foreign bodies, trauma, or chronic infection. The clinical presentation closely resembles sinus disorders described in contemporary surgery. Despite significant advancements in modern surgical techniques, recurrence, prolonged healing, postoperative morbidity, and patient discomfort continue to remain major therapeutic concerns. Ayurveda offers a comprehensive understanding of Nadi Vrana through the concepts of Dosha, Dushya, Agni, and Srotas involvement and recommends multiple treatment modalities including Shastra Karma, Kshara Karma, Agni Karma, and Varti Prayoga. The present review critically evaluates the Ayurvedic concept of Nadi Vrana, its etiopathogenesis, classification, clinical features, diagnosis, and management while correlating these concepts with the contemporary understanding of sinus disease. The review also highlights current evidence and future research opportunities in the field of Ayurvedic wound care.

**Keywords:** Nadi Vrana, Sinus, Dushta Vrana, Shalya Tantra, Ayurveda, Varti Kalpana, Wound Healing, Chronic Sinus.

#### **INTRODUCTION**

Ayurveda, one of the world's oldest medical systems, provides a holistic understanding of health and disease. Among the eight branches of Ayurveda (Ashtanga Ayurveda), Shalya Tantra is primarily concerned with surgical disorders, wound management, foreign body extraction, and para-surgical interventions. Acharya Sushruta, often regarded as the Father of Surgery, described numerous surgical diseases and their management in remarkable detail. Among these, Vrana and its complications occupy a central position due to their prevalence and clinical significance.<sup>1-3</sup>

Vrana is broadly defined as a discontinuity of body tissues resulting from trauma, inflammation, infection, or pathological processes. Sushruta described Vrana as a lesion that leaves a permanent scar even after complete healing. Depending upon the nature and severity of tissue involvement, wounds may heal normally or become

chronic and complicated. Chronic infected wounds exhibiting persistent discharge, inflammation, foul smell, tissue destruction, and delayed healing are categorized under Dushta Vrana.<sup>4</sup>

Nadi Vrana represents a specialized form of Dushta Vrana characterized by the presence of a tubular structure extending into deeper tissues. The condition is notorious for chronicity, recurrence, and resistance to treatment. Classical descriptions indicate that Nadi Vrana develops when an abscess or inflammatory swelling undergoes suppuration but is not adequately drained or treated. The accumulated pus gradually burrows through tissue planes and creates a channel that continuously discharges purulent material.<sup>5</sup>

In contemporary medicine, Nadi Vrana can be correlated with sinus disorders, including pilonidal sinus, perianal sinus, postoperative sinus, osteomyelitic sinus, and chronic discharging tracts resulting from infection or foreign bodies. Although considerable progress has been achieved in surgical management, recurrence remains a significant challenge. Furthermore, prolonged wound care, postoperative discomfort, and healthcare costs continue to affect patient outcomes.<sup>6-8</sup>

The Ayurvedic approach to Nadi Vrana differs substantially from modern management. Rather than focusing solely on local pathology, Ayurveda emphasizes correction of Dosha imbalance, removal of etiological factors, elimination of unhealthy tissue, and restoration of normal tissue healing. Various treatment modalities including Shastra Karma, Kshara Karma, Agni Karma, and Varti Prayoga have been recommended for effective management.<sup>9</sup>

Recent interest in evidence-based traditional medicine has increased the need for systematic evaluation of Ayurvedic concepts and therapies. A comprehensive review of Nadi Vrana is therefore essential to bridge the gap between classical knowledge and contemporary clinical practice.

## **HISTORICAL REVIEW OF NADI VRANA**

### **Vedic Period**

The concept of Nadi Vrana has been recognized in Ayurveda since ancient times and has evolved through different historical periods. Although direct references to Nadi Vrana are not available in pre-Vedic literature, descriptions resembling tubular structures and suppurative disorders can be identified in Vedic texts. The earliest evidence related to Ayurvedic concepts is found in the Rigveda and Atharvaveda.

#### **Atharva Veda: -<sup>10</sup>**

1. In Atharvaveda, the term Nadi is used to denote hollow tubular channels within the body. The word is derived from Nada, meaning a reed-like structure with a hollow cavity.

2. The diminutive of Nada is Nadika

References to diseases characterized by suppuration and discharge indicate that conditions resembling chronic sinus formation and pus-filled tracts were known during that period. However, the specific term Nadi Vrana was not explicitly mentioned. (Atharva Veda 7/78.1)<sup>11</sup>

Speech organ that is wind pipe is denoted by this word.

These two references suggests that in Vedic period also people suffered from pus formation and Nadi Vrana However, the specific term Nadi Vrana was not explicitly mentioned.

### **Samhita Period**

The Samhita period marked a significant advancement in the understanding of Nadi Vrana. Acharya Sushruta<sup>12, 13</sup>, provided a detailed description of the disease, including its aetiology, pathogenesis, clinical features, prognosis, and treatment. Acharya Vagbhata<sup>14</sup> further elaborated upon these concepts and recommended various therapeutic approaches. During this period, the use of medicated Varti, surgical intervention, and wound management techniques gained prominence in the treatment of Nadi Vrana.

### **Medival Period**

During the medieval period, several Ayurvedic scholars contributed to refining the management principles of Nadi Vrana. Acharya Bhavaprakasha<sup>15</sup>, Chakrapani<sup>16</sup> and others, have described therapeutic procedures such as Patana Karma, Varti Prayoga, and Kshara Sutra application etc. in the management of Nadi Vrana.

Classical texts including Bhaisajya Ratnavali<sup>17</sup>, Bangasena Samhita<sup>18</sup>, and Yogaratnakara<sup>19</sup> dedicated separate chapters to the treatment of Nadi Vrana, indicating its clinical importance.

These texts incorporated improved therapeutic modalities while preserving the fundamental principles established by earlier Acharyas.

### **Modern Period**

The modern period witnessed a revival of Ayurvedic surgical practices, particularly after independence. Considerable efforts were made toward standardizing procedures such as Kshara Karma, Kshara Sutra therapy, medicated Varti preparations, and wound-healing formulations. These advancements have enhanced the effectiveness of Ayurvedic management of chronic sinus disorders and Nadi Vrana in contemporary clinical practice.

#### **ETYMOLOGY OF NADI VRANA<sup>20, 21, 22</sup>**

The term Nadi Vrana is composed of two words: Nadi and Vrana. The word Nadi denotes a tubular, reed-like, or hollow channel, whereas Vrana refers to an ulcer or wound. Therefore, Nadi Vrana literally signifies an ulcer associated with a tubular structure. The term reflects the characteristic feature of the disease, namely the presence of a narrow channel extending from the wound into deeper tissues and continuously discharging pus or other secretions.

Various Sanskrit lexicons describe Nadi as a hollow conduit resembling a reed or flute. Based on this morphological similarity, Nadi Vrana has often been correlated with chronic sinus and fistulous conditions described in modern surgical literature.

#### **DEFINITION OF NADI VRANA<sup>23, 24</sup>**

Acharya Sushruta describes Nadi Vrana as a chronic suppurative condition resulting from improper management of inflammatory swellings or ulcers. When a suppurative lesion is either incised prematurely, inadequately drained, or neglected after maturation, accumulated pus penetrates deeper tissues and forms a tract-like channel. This progressively advancing tract assumes the appearance of a tube and continuously discharges purulent material, thereby becoming known as Nadi Vrana.

#### **PARYAYA (SYNONYMS OF NADI VRANA)<sup>25</sup>**

The nomenclature of Nadi Vrana is based on its characteristic mode of progression and discharge. Various Ayurvedic scholars have used different terms to describe this condition. Because the purulent material traverses through a tubular passage and extends deeply into tissues, the disease is referred to as Nadi. Owing to its continuous movement and spread through tissue planes, it is also known as Gati. Some authors have described a single tract as Nadi, whereas multiple branching tracts are designated as Gati<sup>26</sup>. These synonyms emphasize the pathological feature of chronic suppuration extending through a narrow channel within the body.

#### **NIDANA (ETIOLOGICAL FACTORS OF NADI VRANA)**

The etiological factors responsible for Nadi Vrana are closely related to those causing Vrana Shopha (inflammatory swelling), as Vrana Shopha represents the precursor stage of the disease. When Doshas become aggravated due to improper dietary habits, unhealthy lifestyle practices, trauma, or neglect of inflammatory lesions, localized swelling develops between the skin and muscle tissues. If this condition progresses unchecked, suppuration occurs and eventually leads to Nadi Vrana<sup>27</sup>.

Classical texts describe several factors that contribute to Dosha vitiation and the development of inflammatory swellings. These include excessive intake of sour foods, consumption of incompatible dietary combinations, overindulgence in sexual activity, intake of heavy and difficult-to-digest food, excessive physical exertion, riding on animals or vehicles immediately after meals, and various habits that impair digestive and tissue metabolism. Such factors promote Dosha aggravation and create a favourable environment for the development of chronic suppurative disorders<sup>28</sup>.

Neglect of mature abscesses, improper drainage of pus, premature incision of inflammatory swellings, and retention of foreign bodies within tissues are particularly important causes in the pathogenesis of Nadi Vrana.

#### **SAMPRAPTI (PATHOGENESIS OF NADI VRANA)**

The pathogenesis of Nadi Vrana begins with the formation of Vrana Shopha. When a suppurative swelling reaches maturity but is not appropriately treated, the accumulated pus seeks a path of least resistance and penetrates deeper tissues. Instead of draining externally, the purulent material progressively destroys surrounding structures and forms a narrow tubular tract. This process eventually culminates in the development of Nadi Vrana<sup>29</sup>.

Improper surgical intervention also contributes significantly to disease formation. If an immature inflammatory swelling is incised prematurely, damage may occur to muscles, vessels, ligaments, joints, and bones, resulting in pain, bleeding, and secondary complications. Conversely, failure to drain a mature abscess

permits pus accumulation and extensive tissue destruction. In both situations, the disease progresses toward chronic sinus formation.

Continuous exposure to unwholesome dietary and lifestyle factors further aggravates the condition. The accumulated pus burrows through tissue planes, producing cavities and sinus that extend deeply into the affected region. Consequently, the disease becomes chronic, difficult to treat, and prone to recurrence<sup>30</sup>.

Acharya Sushruta compares this process to a fire spreading through dry grass under the influence of wind. Just as fire rapidly consumes surrounding vegetation, undrained pus gradually destroys muscles, vessels, ligaments, and adjacent structures, leading to extensive tissue damage<sup>31</sup>.

### **CLASSIFICATION OF NADI VRANA**

Various Acharyas have classified Nadi Vrana according to the predominance of Doshas and causative factors.

Classification According to Acharya Sushruta<sup>32</sup>: -

Acharya Sushruta described eight varieties of Nadi Vrana:

Vataja Nadi Vrana

Pittaja Nadi Vrana

Kaphaja Nadi Vrana

Vata-Pittaja Nadi Vrana

Vata-Kaphaja Nadi Vrana

Pitta-Kaphaja Nadi Vrana

Tridoshaja Nadi Vrana

Shalyaja Nadi Vrana

Classification According to Vagbhata and Madhavakara: -

Vagbhata<sup>33</sup> and Madhavakara<sup>34</sup> simplified the classification into five types:

Vataja

Pittaja

Kaphaja

Tridoshaja

Shalyaja

This classification is based on the predominance of individual Doshas, combined Doshas, or the presence of retained foreign bodies.

### **LAKSHANAS (CLINICAL FEATURES OF NADI VRANA)**

The clinical manifestations of Nadi Vrana vary according to the predominant Dosha involved in the disease process.

Vataja Nadi Vrana<sup>35, 36</sup>

Vataja Nadi Vrana is characterized by a narrow opening, rough texture, discoloration, and severe pain. The discharge is generally thin, frothy, and excessive, particularly during nighttime. The tract tends to be dry and irregular, reflecting the qualities of aggravated Vata Dosha.

Pittaja Nadi Vrana<sup>37, 38</sup>

In Pittaja Nadi Vrana, patients commonly experience thirst, fever, and burning sensation. The discharge is warm, yellowish, foul-smelling, and profuse, particularly during daytime. Inflammatory features are more pronounced due to the predominance of Pitta Dosha.

Kaphaja Nadi Vrana<sup>39, 40</sup>

Kaphaja Nadi Vrana presents with thick, slimy, and viscous discharge. The tract is often associated with itching, induration, and minimal pain. Discharge tends to increase during the night. The chronic nature and sluggish healing pattern reflect Kapha predominance.

Dwandvaja Nadi Vrana<sup>41</sup>

Dwandvaja varieties arise due to the simultaneous vitiation of two Doshas. Consequently, they exhibit a combination of clinical features corresponding to the involved Doshas.

Tridoshaja Nadi Vrana<sup>42, 43</sup>

Tridoshaja Nadi Vrana demonstrates features of all three Doshas and is usually associated with severe symptoms such as fever, burning sensation, dyspnea, dryness of the mouth, weakness, and occasional syncope. Because of its extensive pathological involvement, it is considered difficult to manage and carries a poor prognosis.

**Shalyaja Nadi Vrana<sup>44, 45</sup>**

Shalyaja Nadi Vrana develops due to the retention of a foreign body within tissues. Persistent pain, continuous discharge of thin pus mixed with blood, local inflammation, and failure of healing are its characteristic features. Unless the retained foreign material is removed, complete recovery remains difficult.

**COMPLICATIONS OF NADI VRANA**

If Nadi Vrana develops in the perineal region and extends toward structures such as the Guda, Bhaga, and Vasti, it may progress into Bhagandara. Chronicity, tissue destruction, recurrent infection, and involvement of deeper anatomical structures constitute major complications of untreated disease.

**SADHYASADHYATA (PROGNOSIS)<sup>46</sup>**

The prognosis of Nadi Vrana depends upon the Doshic involvement and extent of tissue damage. Tridoshaja Nadi Vrana is generally regarded as Asadhya or extremely difficult to cure because of extensive Dosha vitiation and severe tissue destruction. In contrast, Vataja, Pittaja, Kaphaja, and Shalyaja varieties are considered Yatna Sadhya, meaning they can be managed successfully with appropriate and timely treatment.

**MANAGEMENT OF NADI VRANA<sup>47</sup>**

The management of Nadi Vrana involves both medical and surgical approaches. Ayurvedic treatment aims to remove accumulated pus, eradicate unhealthy tissue, promote wound cleansing, and facilitate healing.

The major therapeutic modalities include:

**1. Bhaishajya Chikitsa- :**

Administration of internal and external medications for Dosha pacification, wound purification, and healing.

**2. Kshara Karma- :**

Application of alkaline preparations for debridement of unhealthy tissue and destruction of pathological tracts.

**3. Agni Karma- :**

Therapeutic cauterization employed in selected cases to arrest disease progression and promote healing.

**4. Shastra Karma- :**

Surgical intervention involving incision, excision, drainage, and exploration of sinus.

The general principle advocated by Acharya Sushruta involves opening the sinus, ensuring complete drainage of purulent material, and subsequently employing Shodhana and Ropana therapies to facilitate healthy wound healing<sup>48</sup>.

Acharya Vagbhatta has mentioned Chhedana and application of Lepa according to dosha involvement for the treatment of Nadi Vrana.<sup>49</sup>

Acharya Sushruta has mentioned 60 types of Shashti Upakrama for the management of Nadi Vrana like Kashaya, Varti, Kalka, Ghrita, Taila etc.<sup>50</sup>

**Varti Kalpana**

Varti Kalpana is one of the most important local therapeutic procedures employed in Nadi Vrana. Varti

A Varti is a medicated wick prepared from herbal drugs and designed for insertion into body channels, wounds, and sinus.

**Advantages of Varti Therapy**

- Sustained local drug delivery
- Continuous drainage
- Cleansing of unhealthy tissue
- Promotion of granulation tissue
- Minimal invasiveness
- Cost-effectiveness

The dual mechanical and pharmacological action of Varti makes it particularly useful in chronic sinus disorders

**PATHYA AND APATHYA IN NADI VRANA<sup>51</sup>****PATHYA (RECOMMENDED DIET AND REGIMEN): -**

Successful management of Nadi Vrana requires adherence to a wholesome diet and lifestyle that supports tissue healing and prevents Dosha aggravation. Classical texts recommend the consumption of easily digestible, nourishing, and wound-healing foods, including:

Yava (Barley)

Shashtika Shali

Godhuma (Wheat)  
 Purana Shali  
 Masura  
 Mudga  
 Tuvvari  
 Yusha preparations  
 Madhu (Honey)  
 Sharkara  
 Vilepi  
 Laaja Manda  
 Jangala Mamsa Rasa  
 Ghrita  
 Taila  
 Patola  
 Vetrakra  
 Balamoola  
 Vartaka  
 Karavella  
 Karkotaka  
 Tandulodaka

These dietary measures help maintain digestive strength, facilitate tissue repair, and support wound healing.

**APATHYA (CONTRAINDICATED DIET AND REGIMEN): -**

Patients suffering from Nadi Vrana should avoid factors that impede healing or aggravate Doshas. These include:

Dietary Restrictions  
 Excessively dry foods  
 Cold foods  
 Sour foods  
 Excessively salty foods  
 Incompatible dietary combinations  
 Heavy and unwholesome food articles  
 Lifestyle Restrictions  
 Excessive physical exercise  
 Excessive sexual activity  
 Excessive talking  
 Day sleep and night awakening  
 Excessive walking  
 Mental stress and grief  
 Excessive water intake

**Use of substances incompatible with individual constitution**

Avoidance of these factors is considered essential for proper healing and prevention of recurrence. Classical texts advise continued observance of these restrictions for an extended period to ensure complete recovery.

Nadi Vrana is a chronic suppurative condition described extensively in Ayurvedic surgical literature. It develops primarily due to improper management of inflammatory swellings, inadequate drainage of pus, or retention of foreign bodies. The disease is characterized by the formation of a tubular structure extending into deeper tissues with persistent purulent discharge. Ayurvedic management emphasizes timely diagnosis, proper surgical intervention, Shodhana and Ropana therapies, and the use of specialized formulations such as Vrana Varti. The combined application of surgical and medicinal principles, along with appropriate Pathya-Apathya, forms the foundation for successful management of Nadi Vrana and prevention of recurrence.

**MODERN REVIEW**

**HISTORICAL ASPECTS OF SINUS DISEASE**

The management of sinus has been a challenging aspect of surgery owing to the diversity of their anatomical locations, etiological factors, and pathological characteristics. Sinuses may arise due to congenital abnormalities, chronic infections, obstruction, trauma, or foreign body reactions. Their occurrence in different anatomical regions has led to the development of numerous surgical techniques aimed at achieving complete healing while minimizing recurrence.

Historically, significant contributions have been made to the surgical treatment of sinus disorders. John Arderne described operative procedures for anal sinus during the fourteenth century. Subsequently, Charles Felix successfully performed surgical treatment for anal sinus disease. During the eighteenth century, Percivall Pott emphasized the importance of adequate exposure and drainage of sinus. Later modifications involving ligation techniques, use of silk or rubber setons, and various forms of surgical excision were introduced by surgeons such as Frederick Salmon, Morgan, Milligan, and Gabriel. Despite numerous advancements, no single technique has been universally accepted as superior because recurrence and complications remain significant concerns.

#### **DEFINITION OF SINUS<sup>52</sup>: -**

A sinus is a blind-ended abnormal tract that extends from the surface of the body into deeper tissues. It may communicate with an underlying cavity and is generally lined by unhealthy granulation tissue, although epithelial lining may develop in chronic cases. The term sinus is derived from the Latin word meaning a hollow space, bay, or cavity<sup>53</sup>. Sinus serve as channels through which pathological materials such as pus, necrotic debris, or foreign bodies are discharged from deeper tissues to the external surface.

#### **ETIOLOGICAL FACTORS RESPONSIBLE FOR PERSISTENCE OF SINUS<sup>54,55</sup>: -**

Several local and systemic factors contribute to the persistence and chronicity of sinus. Failure to eliminate these causative factors often results in delayed healing and recurrence.

The major causes include:

Local Factors: -

- Retained foreign bodies such as sutures, sequestra, hair, faecolith, or parasitic infestations.
- Trauma and repeated tissue injury.
- Inadequate drainage of abscesses.
- Persistent local infection.
- Epithelialization of the sinus.
- Dense fibrosis surrounding the tract, preventing collapse and healing.
- Obstruction distal to the sinus.
- Malignant transformation or associated neoplastic conditions.
- Local ischemia impairing tissue repair.

Systemic Factors

- Malnutrition.
- Chronic inflammatory bowel diseases such as Crohn's disease.
- Long-term use of corticosteroids and cytotoxic drugs.
- Specific infections including tuberculosis and actinomycosis.

#### **CLASSIFICATION OF SINUS<sup>56</sup>: -**

Sinuses may be classified broadly into congenital and acquired varieties.

Congenital Sinuses: -

Congenital sinuses arise due to developmental abnormalities and include:

- Preauricular sinus
- Umbilical sinus
- Urachal sinus
- Coccygeal sinus
- Sacral sinus

These lesions are generally present from birth and result from incomplete embryological fusion or developmental defects.

**Acquired Sinuses: -**

Acquired sinuses develop secondary to infection, trauma, surgery, or chronic inflammatory processes. Common examples include:

- Pilonidal sinus
- Suture sinus
- Perineal sinus
- Postoperative abdominal sinus
- Hidradenitis suppurativa
- Actinomycotic sinus
- Tuberculous sinus
- Osteomyelitic sinus

These conditions usually arise due to persistent pathological processes within deeper tissues.

#### **ANATOMICAL LOCATIONS OF SINUSES<sup>57</sup>: -**

Sinuses may occur in various regions of the body depending upon the underlying pathology.

##### **Perianal Region: -**

The anorectal region represents the most common site of sinus formation. Factors contributing to this high incidence include frequent bacterial contamination from fecal matter, repeated trauma, and the complex anatomy of anal glands and crypts.

##### **Long Bones: -**

Chronic osteomyelitis often results in sinus formation over the ends of long bones due to persistent infection and sequestrum formation.

##### **Preauricular Region: -**

Congenital preauricular sinuses occur near the root of the helix or tragus of the external ear due to defective fusion of auricular hillocks during embryonic development.

##### **Pilonidal Region: -**

Pilonidal sinuses typically occur within the natal cleft and contain hair embedded within granulation tissue. Similar lesions may occasionally occur in interdigital spaces, axillae, and facial regions.

##### **Umbilical Region: -**

Umbilical sinuses may develop due to retained foreign bodies, hair entry, diverticular disease, gallstones, or carcinoma involving adjacent organs.

##### **Cervical Region: -**

Multiple sinuses may occur in the neck due to actinomycosis, branchial sinus anomalies, or rupture of infected thyroglossal cysts.

##### **Subcutaneous Tissues: -**

Sinus may develop anywhere in subcutaneous tissues following abscess formation, trauma, or chronic infection.

#### **PATHOPHYSIOLOGY OF SINUS FORMATION<sup>58</sup>: -**

Sinus formation is generally the result of chronic inflammation and persistent pathological processes occurring within deeper tissues. Chronic infection leads to tissue necrosis and liquefaction, resulting in accumulation of purulent material. As local pressure gradually increases, the body attempts to expel these pathological contents through the path of least resistance, thereby creating a channel that opens externally. This channel eventually develops into a sinus.

The process usually begins with abscess formation. When adequate drainage is not achieved, the collection persists and progressively burrows through adjacent tissues. Over time, the tract becomes lined with granulation tissue or epithelium and may be surrounded by dense fibrosis, preventing spontaneous closure.

Specific pathological conditions contributing to sinus formation include:

- Infective Causes
- Tuberculous lymphadenitis
- Osteomyelitis
- Actinomycosis
- Bilharziasis
- Lymphogranuloma venereum

- Chronic inflammatory bowel disease
- Ulcerative proctocolitis

These diseases often produce chronic suppuration and tissue destruction leading to persistent sinus.

#### **TRAUMATIC CAUSES: -**

Trauma may result in hematoma formation, secondary infection, abscess formation, and eventual sinus development if adequate drainage is not established. This mechanism is particularly relevant in anorectal sinus disease.

#### **CONGENITAL CAUSES: -**

Congenital sinuses arise from incomplete fusion of embryological structures, as seen in bronchial and preauricular sinuses.

#### **NEOPLASTIC CAUSES: -**

Certain malignancies may produce sinus through tissue invasion, necrosis, and secondary infection.

#### **PILONIDAL SINUS PATHOGENESIS:**

After puberty, hormonal influences stimulate pilosebaceous glands, resulting in follicular blockage and folliculitis. Progressive inflammation leads to abscess formation and subsequent sinus development. Loose hairs become trapped within the tract, inducing a foreign-body reaction and perpetuating chronic inflammation. Repeated friction and movement facilitate further penetration of hair into the tract, thereby sustaining the disease process.

#### **CLINICAL FEATURES OF SINUS<sup>59</sup>: -**

The presentation of sinus disease varies according to its cause, location, and duration.

##### **External Opening: -**

A sinus usually presents as one or more small openings on the skin surface. These openings may be slightly elevated and surrounded by granulation tissue.

##### **Pain: -**

Pain is not always present. It usually occurs when drainage becomes obstructed, resulting in accumulation of purulent material and increased pressure within the tract. In neoplastic lesions, pain may become persistent and severe.

##### **Irritation: -**

Persistent discharge from the sinus frequently causes local irritation and discomfort.

##### **Discharge: -**

Discharge characteristics often provide clues regarding underlying pathology.

Staphylococcal infections produce thick yellow pus.

Streptococcal infections produce thin watery discharge.

Pseudomonas infections produce bluish-green discharge.

Actinomyces may reveal sulphur granules.

Osteomyelitis may discharge bone sequestra.

Enteric fistulae may discharge faecal material or bile.

##### **Odour: -**

The odour of discharge depends on the causative organism. Certain bacterial infections produce foul-smelling discharge due to proteolytic activity.

##### **Surrounding Skin Changes: -**

The surrounding skin may show scars, pigmentation, dermatitis, or signs of previous infection. These findings are particularly common in chronic osteomyelitis, tuberculosis, Crohn's disease, and actinomyces.

##### **Sinus Wall: -**

Long-standing sinuses often develop thick fibrotic walls due to chronic inflammation.

##### **Tenderness: -**

Tenderness becomes evident when the tract is obstructed and drainage is impaired.

**Figure-1. Various types of sinus**



**COMPLICATIONS OF SINUS: -**

Complications associated with chronic sinus disease include:

- Abscess formation.
- Recurrent inflammation.
- Recurrence after treatment.
- Development of fistulae.
- Extensive tissue destruction.
- Formation of large cavities, particularly in osteomyelitis.

The most important complication is fistula formation, especially when the sinus communicates with a hollow organ. Fistula-in-ano represents a classic example of this progression.

**DIFFERENTIAL DIAGNOSIS: -**

Conditions that should be differentiated from sinus disease include:

- Post-anal dermoid cyst.
- Fistula-in-Ano.

**MANAGEMENT OF SINUS<sup>60</sup>: -**

The management of sinus aims to eliminate the underlying pathology, facilitate drainage, and promote healing from the base of the tract.

Principles of Treatment: -

Removal of causative and obstructive factors.

Complete exposure of sinus.

Promotion of healing from the deepest part of the wound.

Prevention of excessive scar formation.

Treatment of specific infections.

Removal of granulation tissue and epithelial lining where necessary.

**Surgical Techniques: -**

Common surgical procedures include:

**Excision with Primary Closure**

The entire tract is excised and the wound is closed primarily.

**Laying Open the Tract**

The sinus is opened completely and allowed to heal by secondary intention.

**Excision of Fibrotic Tissue**

Dense fibrous tissue surrounding the tract is removed to facilitate healing.

**Curettage**

Hair, debris, granulation tissue, and infected material are removed to encourage healthy granulation.

Additional procedures such as marsupialization, fistulization, phenol injection, and extensive excision have been employed for specific conditions like pilonidal sinus.

**Non-Operative and Para-Surgical Procedures: -**

Several para-surgical approaches have been described, particularly within indigenous systems of medicine.

These include:

Alkaline therapy.

Oil infiltration techniques.

Seton-based procedures.

Other minimally invasive methods.

Earlier practices involving injection of irritant chemicals such as silver nitrate and urethane have largely been abandoned due to complications and inconsistent results.

**LACUNAE IN PRESENT-DAY MANAGEMENT: -**

Despite advances in surgery, several limitations continue to challenge the management of chronic sinus disease:

High recurrence rates.

Excessive scar formation and contracture.

Functional impairment due to extensive tissue excision.

Prolonged hospitalization.

Difficulty identifying multiple minute sinus.

Requirement for disease-specific treatment in chronic infections.

A sinus is a chronic pathological tract that develops secondary to persistent infection, foreign bodies, trauma, congenital anomalies, or obstruction. Successful management requires identification and elimination of the underlying cause, adequate drainage, removal of unhealthy tissue, and promotion of healthy wound healing. Despite numerous surgical and para-surgical approaches, recurrence remains a major concern, highlighting the need for safer, more effective, and minimally invasive treatment modalities.

**CONCLUSION**

Nadi Vrana is a chronic and recurrent surgical disorder that continues to pose therapeutic challenges despite advances in modern medicine. Ayurvedic literature provides a remarkably detailed description of the disease, including its etiology, pathogenesis, classification, prognosis, and management.

The concepts described by Acharya Sushruta correlate closely with the contemporary understanding of sinus disease. Classical therapeutic modalities such as Shastra Karma, Kshara Karma, Agni Karma, and Varti Prayoga offer unique approaches for effective management.

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