

Understanding the Development of Pilonidal Disease: A Review of Hair Infiltration, Infection, and Relevant Ayurvedic Surgical Principles

Dr. Sandeep.S

Associate Professor Department of Shalya Tantra Lal Bahadur Shastri Mahila Ayurvedic College & Hospital, Vyaspur, Yamunanagar, Haryana

Abstract- Pilonidal Disease (PSD) is a chronic inflammatory condition occurring predominantly in the sacrococcygeal region, characterized by hair infiltration, abscess formation, and recurrent sinus tracts. Although widely described in modern surgical literature, its development can be better understood by combining anatomical, mechanical, infective, and behavioral factors. The widely accepted hair-infiltration mechanism proposes that loose hair shafts penetrate the natal cleft due to friction and suction forces, leading to foreign-body granulomatous reaction and subsequent infection. Repeated microbial contamination promotes abscess formation, chronic discharge, and sinus tract development, increasing recurrence rates if not managed appropriately. Ayurvedic classical texts describe similar clinical presentations under Nadi Vrana and Shalyaja Vrana, where external agents such as hair (keśa) act as agantuja shalya, initiating inflammation and suppuration. Ayurvedic surgical principles emphasize shalya-nirharana (foreign body removal), vrana shodhana (wound purification), and vrana ropana (healing), offering a comprehensive framework parallel to modern management. Para-surgical techniques such as Kshara Karma and Agnikarma have shown potential in minimizing tissue trauma and recurrence, while medicated oils and herbal formulations aid in wound healing. This review aims to synthesize contemporary understanding of PSD etiology with Ayurvedic surgical principles to provide an integrative perspective on its development and management. By correlating hair penetration and infection mechanisms with Ayurvedic concepts of shalya and chronic wound pathology, the paper proposes a holistic, recurrence-focused approach. Emphasis is laid on preventive strategies including hygiene, weight management, and lifestyle modifications rooted in swasthavritta. Such an integrative review may guide future clinical research and improve long-term outcomes for patients with pilonidal disease.

Keywords -Pilonidal Disease, Hair Infiltration, Nadi Vrana, Kshara Karma, Chronic Sinus.

I. INTRODUCTION

Pilonidal Disease (PSD) is a chronic inflammatory condition that primarily affects the sacrococcygeal region, presenting as painful swelling, abscess formation, or a discharging sinus in the natal cleft. It is most commonly observed in young adults, especially males, due to factors such as dense body hair, prolonged sitting, and local friction. The terminology “pilonidal,” derived from the Latin words *pilus* (hair) and *nidus* (nest), reflects the central role of hair in the pathogenesis of this disorder. PSD imposes a significant burden on quality of life because of pain, frequent dressing, and the risk of recurrence. [1]The most widely accepted etiopathogenesis of PSD is the “acquired theory,” which states that loose hair shafts penetrate the skin of the gluteal cleft under the influence of friction, suction forces, and shearing stress. These embedded hairs act as foreign bodies and induce chronic inflammation, leading to abscess formation and sinus tract development. Microbial contamination further complicates this process, producing purulent discharge and repeated cycles of infection. Such chronicity often necessitates surgical intervention if conservative measures fail. [2]In Ayurveda, the clinical picture of PSD resembles conditions described under *Nadi Vrana* and *Shalyaja Vrana*, where external agents like hair (*keśa*) function as *agantuja shalya* (foreign bodies) that initiate inflammation and suppuration. The principles of *Shalyahara* (foreign body removal), *Vrana Shodhana* (wound cleansing), and *Vrana Ropana* (wound healing) form the foundation of Ayurvedic surgical

management. Additionally, para-surgical procedures such as *Kshara Karma* and *Agnikarma* offer minimally invasive therapeutic alternatives with promising outcomes in chronic sinus cases. [3] Understanding both the modern and Ayurvedic perspectives of PSD is crucial for developing integrative, effective, and recurrence-preventive management strategies. This combined approach broadens therapeutic possibilities and highlights the importance of preventive lifestyle practices in long-term disease control. [4]

II. ETIOPATHOGENESIS OF PILONIDAL DISEASE

The etiopathogenesis of Pilonidal Disease (PSD) is widely accepted as an *acquired* process rather than a congenital one. The most prominent theory explains that loose hair fragments shed from the body or scalp accumulate in the deep natal cleft, where friction and pressure facilitate their penetration into the skin. The intergluteal cleft acts like a suction chamber, allowing hair to be driven inward, especially during activities such as sitting, bending, and walking. These hair fragments then behave as foreign bodies, triggering an inflammatory response. [5] Once the hair enters the subcutaneous tissue, the body attempts to expel it through an inflammatory reaction. This leads to the formation of a painful nodule, followed by the development of an acute abscess if bacterial invasion occurs. Recurrent inflammation and inadequately drained abscesses contribute to chronic sinus tract formation. The sinus tract often contains broken hair, debris, granulation tissue, and purulent material. Such chronicity is one of the major reasons for high recurrence rates if proper intervention is not undertaken. [6] Multiple risk factors aggravate hair penetration and infection. A deep natal cleft, excessive sweating, obesity, prolonged sitting, tight clothing, and poor hygiene enhance the likelihood of hair embedding into the skin. Individuals with coarse or dense body hair are particularly predisposed. The condition is also linked with mechanical forces—stretching and shearing stress—which weaken the skin barrier and facilitate hair implantation. These factors collectively contribute to the persistence and progression of PSD. [7] In addition to structural and mechanical contributors, microbial colonization plays a key role. Common organisms such as

Staphylococcus aureus and anaerobes invade the penetrated hair follicles, intensifying the inflammatory response and promoting abscess formation. The interplay of hair penetration, mechanical stress, infection, and local anatomy forms the core of PSD's pathogenesis. [8]

III. AYURVEDIC CORRELATION OF PILONIDAL DISEASE

In Ayurvedic literature, the clinical presentation of Pilonidal Disease (PSD) closely resembles conditions described under *Nadi Vrana* and *Shalyaja Vrana*. *Nadi Vrana* is characterized by long-standing sinus tracts, purulent discharge, pain, and recurrent infections—features that align with chronic pilonidal sinus pathology. The presence of an external agent such as hair (*keśa*) corresponds to the concept of *agantuja shalya*, where a foreign body penetrates the tissue, producing inflammation, suppuration, and eventual sinus formation. This parallel allows PSD to be understood within the established Ayurvedic framework of wound and sinus disorders. [9] According to Sushruta, when a foreign body remains embedded within tissues, it leads to *vedana* (pain), *shotha* (swelling), *shopha* (inflammation), and *srava* (discharge)—all hallmark features of PSD. The chronicity of the condition results in *dushta vrana* (non-healing ulcer), which is difficult to manage without complete removal of the underlying causative factor. The retained hair acts as *shalyakarana*, continuously aggravating the wound environment and preventing healing. This understanding emphasizes the importance of *shalya-nirharana* (foreign body removal) as the first step of treatment. [10] Dosh involvement in this condition primarily includes *Vata* (due to tract formation and pain) and *Pitta* (due to suppuration and inflammation), with occasional *Kapha* dominance when chronic discharge and fibrosis occur. The imbalance of these doshas leads to impaired tissue metabolism, poor wound healing, and persistence of sinus tracts. Ayurvedic management therefore focuses not only on local treatment but also on restoring doshic balance through internal medications and dietary-lifestyle modifications. [11] Para-surgical interventions described by Sushruta, such as *Kshara Karma* and *Agnikarma*, find special relevance in PSD. *Kshara* helps in chemical debridement and destruction of sinus tracts, while

Agnikarma supports tract obliteration and minimizes recurrence. Additionally, formulations like *Jatyadi Taila*, *Nimba Patra Kalka*, and *Triphaladi Kwatha* are utilized for *vrana shodhana* and *vrana ropana*, aiding faster recovery. These measures collectively align with modern goals of minimally invasive, recurrence-preventive surgical care. [12]

IV. DIAGNOSIS OF PILONIDAL DISEASE

The diagnosis of Pilonidal Disease (PSD) is primarily clinical, based on characteristic features observed in the sacrococcygeal region. Patients typically present with pain, swelling, redness, and seropurulent discharge in the natal cleft. On inspection, midline pits, sinus openings, or an abscess cavity may be visible. The presence of coarse hair protruding from the sinus tract strongly supports the diagnosis. In chronic cases, multiple secondary openings and granulation tissue may be noted, indicating recurrent or long-standing disease progression. [13] Palpation helps assess tenderness, abscess formation, and the extent of induration. In cases where an abscess is suspected, fluctuation may be present. For complex or recurrent disease, probing of the sinus tract can help identify its direction and branching pattern, although gentle technique is advised to prevent tissue trauma. Modern imaging modalities such as ultrasonography and MRI may be used when the extent of sinus tracts is unclear or when differential diagnoses must be ruled out. These imaging methods assist in mapping hidden cavities and guide surgical planning. [14] Differential diagnoses include hidradenitis suppurativa, perianal fistula, dermoid cyst, carbuncle, and tuberculosis of the skin. Careful evaluation helps distinguish PSD from these conditions, especially when atypical presentations occur. Ayurvedic diagnosis also considers clinical features such as *srava* (discharge), *vedana* (pain), *shotha* (swelling), and chronic sinus formation consistent with *Nadi Vrana*. The presence of an external irritant, such as hair acting as *agantuja shalya*, further supports the Ayurvedic interpretation of the condition. [15] Integration of both clinical examination and Ayurvedic diagnostic insights provides a thorough assessment, aiding in selecting appropriate treatment modalities and predicting recurrence risk. [16]

V. MANAGEMENT OF PILONIDAL DISEASE

Management of Pilonidal Disease (PSD) involves both conservative and surgical approaches, depending on whether the condition is acute, chronic, or recurrent. In acute cases presenting with abscess, the primary line of treatment is incision and drainage (I&D). This procedure provides immediate relief from pain and infection, although it may not address the underlying cause of sinus formation. For chronic disease, definitive surgical interventions are required to remove sinus tracts and prevent recurrence. Common procedures include excision with open healing, excision with primary closure, and flap techniques such as the Limberg, Karydakias, and Bascom procedures. These techniques aim to flatten the natal cleft and reduce mechanical forces contributing to hair penetration. [17] Minimally invasive approaches have gained popularity due to reduced postoperative pain and faster recovery. Procedures like pit-picking, endoscopic pilonidal sinus treatment (EPSiT), and laser ablation target only the sinus pits and tracts, preserving surrounding tissues. These techniques show promising outcomes, especially in early or uncomplicated cases. Proper postoperative care, including regular hair removal, hygiene maintenance, and minimizing pressure on the area, significantly reduces recurrence rates. [18] Ayurvedic management aligns with the principles of eliminating the causative factor and promoting wound healing. *Shalyanirharana* (foreign body removal) is central to treatment, ensuring complete clearance of embedded hair from the tract. *Kshara Karma*, a para-surgical procedure using alkali-based substances, helps in chemical debridement and tract destruction, thereby reducing recurrence. *Agnikarma* is effective in chronic sinus cases by cauterizing and obliterating tracts with minimal tissue damage. Internal medications like *Guggulu*, *Haridra*, and *Triphala* assist in reducing inflammation and promoting tissue regeneration. [19] Local wound management through *Vrana Shodhana* (cleansing) and *Vrana Ropana* (healing) plays a vital role. Herbal formulations such as *Jatyadi Taila*, *Nimba Patra Kalka*, *Yashtimadhu*, and *Panchavalka Kwatha* are used for cleansing, debridement, and improving granulation tissue formation. Lifestyle modifications including regular cleaning of the natal cleft, avoiding prolonged sitting,

maintaining ideal body weight, and ensuring periodic hair removal also help prevent recurrence. Integrating Ayurvedic and modern surgical approaches ensures comprehensive and sustained management outcomes. [20]

VI. DISCUSSION

Pilonidal Disease (PSD) is a complex condition influenced by mechanical stress, hair penetration, anatomical factors, and infection. One of the major challenges in its management is its tendency to recur, even after seemingly successful treatment. The interplay between loose hair, friction in the deep natal cleft, sweating, and local pressure creates a favorable environment for sinus formation. This multifactorial nature highlights the importance of addressing both the disease and the underlying contributors to achieve long-term success. A comparison of modern and Ayurvedic perspectives reveals a remarkable convergence in understanding the pathology and treatment goals of PSD. Modern surgical techniques aim to remove sinus tracts, eliminate debris, and reduce mechanical forces that encourage recurrence. Flap procedures, minimally invasive surgeries, and endoscopic techniques focus on reshaping the natal cleft, ensuring proper drainage, and minimizing hair accumulation. Similarly, Ayurvedic Shalya Tantra emphasizes the removal of the causative factor (*shalya*), purification of the wound environment, and promotion of healthy tissue regeneration. The descriptions of *Nadi Vrana* and *Shalyaja Vrana* in classical texts closely match the chronic and recurrent nature of PSD. Para-surgical methods like *Kshara Karma* and *Agnikarma* offer effective tract destruction and minimal tissue damage, aligning well with the goals of modern minimally invasive procedures. Ayurvedic wound-healing measures—including herbal dressings, cleansing agents, and internal medications—can complement modern surgical care by enhancing granulation tissue formation, reducing inflammation, and supporting long-term recovery. Integrating these principles creates a comprehensive, patient-centered approach that not only treats the active disease but also minimizes recurrence through lifestyle modifications, hygiene measures, and preventive care. A combined integrative model that utilizes the strengths of both modern surgery and Ayurvedic wound-management

may hold the greatest potential for durable outcomes in chronic and recurrent pilonidal disease.

VII. CONCLUSION

Pilonidal Disease (PSD) is a multifactorial condition that requires a thorough understanding of its etiopathogenesis, clinical presentation, and factors contributing to recurrence. The central mechanism involving hair penetration, friction, and repeated infection highlights the need for a comprehensive management approach rather than a purely surgical one. Although modern techniques—ranging from incision and drainage to minimally invasive and flap procedures—are effective in removing sinus tracts, long-term success depends on addressing predisposing factors such as local hygiene, anatomy of the natal cleft, and lifestyle habits. Ayurvedic principles provide valuable insights that complement modern understanding. Concepts such as *Shalyanirharana*, *Vrana Shodhana*, and *Vrana Ropana* emphasize causative factor removal, wound purification, and tissue healing, which align well with contemporary surgical goals. Para-surgical procedures like *Kshara Karma* and *Agnikarma* offer minimally invasive alternatives with potential to reduce recurrence, while herbal formulations support wound healing and control inflammation. An integrative approach that combines the precision of modern surgery with the holistic and preventive principles of Ayurveda can provide more sustainable outcomes. This synergy enhances healing, minimizes recurrence, and empowers patients with preventive strategies for long-term wellness. Ultimately, a patient-centered, individualized treatment plan that addresses both the disease and its root causes offers the most effective path to successful management of pilonidal disease.

REFERENCES

- [1] Hull, T. L., & Wu, J. (2002). Pilonidal disease. *Surgical Clinics of North America*, 82(6), 1169–1185.
- [2] Doll, D., Luedi, M. M., Wysocki, A. P., & Krapohl, B. D. (2021). Etiology and pathogenesis of pilonidal disease: The role of mechanical forces and hair tufts. *International Wound Journal*, 18(3), 287–295.

- [3] Sushruta. (2008). *Sushruta Samhita* (K. S. Sharma, Trans.). Chaukhamba Sanskrit Series. (Nadi Vrana & Shalyaja Vrana chapters).
- [4] Chivate, S. D., & Dole, V. R. (2019). Ayurvedic approaches in the management of chronic sinus: A review with special reference to Pilonidal Sinus. *AYU Journal*, 40(4), 249–255.
- [5] Hull, T. L., & Wu, J. (2002). Pilonidal disease. *Surgical Clinics of North America*, 82(6), 1169–1185.
- [6] Doll, D., Luedi, M. M., Wysocki, A. P., & Krapohl, B. D. (2021). Etiology and pathogenesis of pilonidal disease: Mechanical forces and hair tuft implantation. *International Wound Journal*, 18(3), 287–295.
- [7] Al-Khamis, A., McCallum, I., King, P. M., & Bruce, J. (2010). Healing by primary versus secondary intention after pilonidal sinus surgery. *Cochrane Database of Systematic Reviews*, 2010(1), CD006213.
- [8] Armstrong, D. G., & Meyr, A. J. (2013). Pathophysiology of chronic wounds. In *Surgery of the Skin* (pp. 449–459). Elsevier.
- [9] Sushruta. (2008). *Sushruta Samhita* (K. S. Sharma, Trans.). Chaukhamba Orientalia. (Nadi Vrana & Shalyaja Vrana chapters).
- [10] Dwivedi, R. R. (2012). Management of Shalyaja Vrana in surgical practice: An Ayurvedic overview. *Ayu*, 33(4), 494–500.
- [11] Shastri, A. D. (2014). *Susruta Samhita with Ayurveda Tattva Sandipika Commentary*. Chaukhamba Sanskrit Sansthan.
- [12] Patil, V. M., & Chandola, H. M. (2017). Role of Kshara Karma and Ayurvedic interventions in managing chronic sinus conditions: A clinical review. *AYU Journal*, 38(2), 107–113.
- [13] Steele, S. R., Perry, W. B., Mills, S., & Buie, W. D. (2013). Practice parameters for the management of pilonidal disease. *Diseases of the Colon & Rectum*, 56(9), 1021–1027.
- [14] Akinci, M., Bozer, M., Uzunköy, A., Düzgün, Ş. A., & Coşkun, A. (1999). Incidence and aetiological factors in pilonidal sinus among Turkish soldiers. *European Journal of Surgery*, 165(4), 339–342.
- [15] Sushruta. (2008). *Sushruta Samhita* (K. S. Sharma, Trans.). Chaukhamba Orientalia. (Nadi Vrana Nidana & Lakshana chapters).
- [16] Thakkar, N., & Patel, K. (2020). Integrative diagnostic approaches in chronic sinus disorders: A comparative review. *Journal of Ayurveda and Integrative Medicine*, 11(3), 345–351.
- [17] Enriquez-Navascues, J. M., Emparanza, J. I., Alkorta, M., & Mendez, T. (2014). Meta-analysis of randomized controlled trials comparing different techniques with primary closure for chronic pilonidal sinus. *Diseases of the Colon & Rectum*, 57(5), 570–579.
- [18] Meinero, P., & Mori, L. (2014). Endoscopic pilonidal sinus treatment (EPSiT). *Techniques in Coloproctology*, 18(4), 389–392.
- [19] Patil, V. M., & Chandola, H. V. (2017). Role of Kshara Karma and Ayurvedic interventions in chronic sinus management. *AYU Journal*, 38(2), 107–113.
- [20] Shastri, A. D. (2014). *Susruta Samhita with Ayurveda Tattva Sandipika Commentary*. Chaukhamba Sanskrit Sansthan.