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"*KATUPILA* (*FLUEGGEA LEUCOPYRUS*) *AVACHURNANA*: A NOVEL AND EFFECTIVE APPROACH TO PILONIDAL SINUS MANAGEMENT- A CASE SERIES"

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ABSTRACT
Pilonidal Sinus is an epithelial tract which is often hair filled and located in the skin of the natal cleft just beyond the anus is mostly seen in second decade with an incidence of 26 per 1,00,000 populations. The disease is more common in males than in females in the ratio of approximately 4:1. According to Acharya Sushruta, hair is one of the contributory factors in the development of sinus. Present day management of Pilonidal sinus is based on removal of causative factors which include radical excision of the tract. Patients complain of pain and discomfort. Recurrence is about 20% with adequate excision of the tract and proper post surgical wound management. Ayurvedic line of treatment includes para surgical management like *Kshara sutra* ligation, *Taila daha* and *Varti prayoga*. These procedures are simple and economical which can be performed on OPD basis but the patient has to visit OPD regularly for *Kshara sutra* ligation and dressing until the wound is completely healed. *Kshara sutra* ligation is a painful procedure does have its own limitations and recurrence (5%) too. The study involves topical application of Katupila (*Flueggea leucopyrus*) churna over the sinus to counter the limitations and enhance the healing rate of the sinus effectively.

KEYWORDS: Pilonidal sinus, *Ksharasutra*, *Katupila*, *Avachurnana*, (*Flueggea leucopyrus*) and Topical application.

INTRODUCTION
In Latin: *Pilus*- hair, *Nodus*-nest: Hodges, 1880. Pilonodal sinus is an epithelium lined tract situated short distance behind the anus, containing hair and unhealthy granulation tissue. It is also termed as Jeep's disease and Bottom's disease.[1]

Basically, pilonidal sinus is a subcutaneous tract lined by skin and there are no hair growing within it. But the hair in the sinus are short and broken pieces of hair that either get sucked in to the pre-existing dimple in the skin or actually pierces the normal skin in the gluteal cleft, which act as foreign body to develop the sinus and also causes its persistence by chronic infection.

Shabdakalpadruma describes *Nadivrana* as a *Vrana* which discharges pus at all time and as an ulcer having a tract inside it.

Ayurveda classics describe various modes of management of *Shalyaja nadi vrana* among which *Kshara sutra* ligation is widely accepted and practiced.[2]

Katupila, scientifically known as *Flueggea leucopyrus*, is a shrub found in dry, tropical regions, particularly recognized in Sri Lanka and the Saurashtra area of India. Revered in traditional medicine, especially in these regions, it's a well-established folklore remedy, primarily utilized topically as a paste made from its leaves. *Katupila* is traditionally employed to address various wound types, including acute, chronic, and non-healing ones, and is also used for its antiseptic properties to aid in wound cleansing.

The present study aims to explore the wound healing properties of the drug in cases of Pilonodal sinus.

CASE DESCRIPTION
- **Case 1**

An 18 year old male observed staining of his under garments since 2 months associated with on and off fever. He consulted Allopathic hospital where in he was diagnosed with Pilonidal sinus. He was advised with oral medications and sitz bath for 2 weeks. On finding little relief, he was suggested to undergo Laser surgery. The

patient unwilling for surgery came to OPD, Department of Shalya tantra, GAMC, Bengaluru for management.

He was treated with *Apamarga Kshara sutra* ligation and oral medications. The condition subsided and the track healed. A week later he returned with the complaints of pus discharge in the same region. The condition had recurred.

Local examination

- On Inspection

Site- Natal cleft
Discharge- pus along with blood
Opening: Number- 1

- On Palpation

Induration- around the opening
Local temperature- warmth present over the area of induration

- Probing

Length of the tract- 2cm
Investigations: Routine blood investigations were carried out-within normal limit

- **Case 2**

A 25 year old male came to opd with complaints of painful swelling and pus discharge from natal cleft since 1 year. He was diagnosed with Pilonidal sinus and was advised Apamarga *Ksharasutra* ligation but the condition did not subside. Therefore, he underwent *Apamarga Pratisaraniya Ksharakarma*. Still, there was no proper wound closure.

Local examination

- On Inspection

Site- Natal cleft
Discharge- pus along with blood
Opening: Number- 1

- On Palpation

Induration- around the opening
Local temperature- warmth present over the area of induration

- Probing

Length of the tract- 3 cm
Investigations: Routine blood investigations were carried out- within normal limit.

Table 1: Indicating the complaints of the patients.

Subject	Pain	Swelling	Discharge	Fever
A	+	-	+	+
B	+	+	+	-

MATERIAL AND METHOD

- Intervention: Local dressing of the wound by *Katupila Churna*
- *Katupila Churna*: The powder of *Katupila* leaves was made available from an authentic traditional and folklore pharmacy from Srilanka

Probing the sinus
⇩
Assessment of the tract length
⇩
Katupila Avachurnana
⇩
Wound closed with gauze and cotton pad

(*Katupila Avachurnana* was done once in three days)

(Flowchart 1: Describing the intervention)

(Image 1: *Katupila churna*)

OBSERVATION

Table 2: Showing changes after Katupila Avachurnana.

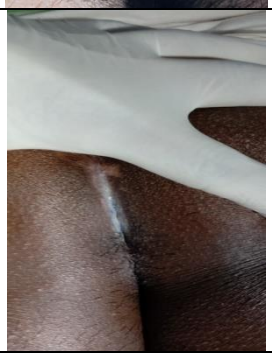
Subjects	After 1st sitting	After 2nd sitting
A	Pus discharge-reduced	Pus discharge-reduced
	Induration-reduced	Induration-reduced
	Length of tract-2 cm	Length of tract-1.75 cm
B	Pus discharge-reduced	Pus discharge-reduced
	Induration-reduced	Induration-reduced
	Length of tract-2.75 cm	Length of tract-2.5 cm
	After 3rd sitting	**After 4th sitting**
A	Pus discharge-Nil	Pus discharge-Nil
	Induration-Absent	Induration-Absent
	Length of tract-1.5 cm	Length of tract-1 cm
B	Pus discharge- Nil	Pus discharge- Nil

	Induration- Absent	Induration- Absent
	Length of tract-1 cm	Length of tract- 0.5 cm
	After 5th sitting	**After 6th sitting**
A	Pus discharge-Nil	Pus discharge-Nil
	Induration-Absent	Induration-Absent
	Length of tract- 0.5 cm	No tract- Wound healed
B	Pus discharge- Nil	Pus discharge- Nil
	Induration- Absent	Induration- Absent
	No tract- Wound healed	No tract- Wound healed

- As there was no pus discharge after intervention, Katupila Avachurna enhanced the sterility of the wound

RESULTS

Table 3: Showing time taken for wound healing after *Katupila Avachurnana*.

Subjects	Before treatment	After treatment	Length of the tract	Time taken for wound healing
A			2cm	12 days
B			3cm	15 days

- After *Katupila Avachurnana*, there was formation of healthy granulation tissue from the base of the wound sitting by sitting
- The process of wound contraction commenced from the first sitting
- The margin of wound became bluish showing growing epithelium
- When the wound healed completely, there was no induration around the wound

DISCUSSION

○ Tannins are the primary bioactive compounds responsible for *Katupila's* wound-healing properties. These compounds are known for their astringent qualities, which help in tissue constriction, promoting the formation of a protective barrier over the wound. This action is essential for preventing excessive bleeding and controlling exudation, particularly during the early inflammatory phase of wound healing.[2]

○ Tannins also contribute to granulation tissue formation by stimulating the regeneration of connective tissue. Granulation tissue is a key component of wound healing, as it forms the base for epithelial cell migration and the development of new blood vessels (neovascularization).

○ In addition to aiding tissue regeneration, tannins possess significant antioxidant properties, which prevent oxidative damage to the wound site. By scavenging free radicals, tannins help protect the developing granulation tissue from oxidative stress, ensuring a healthier healing environment.

○ The presence of flavonoids in *Katupila* enhances its wound-healing properties by promoting angiogenesis, the process of new blood vessel formation, which is essential for nourishing and oxygenating healing tissues.

- Flavonoids can increase the availability of nitric oxide in hypoxic tissues, stimulating neovascularization. This is crucial for enhancing blood flow to the wound site and facilitating the delivery of nutrients and oxygen to the granulation tissue, thus accelerating healing and tissue regeneration.

- By promoting the formation of new blood vessels, flavonoids help in the formation of a robust granulation tissue matrix, which forms the scaffold for new epithelial cells and enhances the integrity of the healing tissue.

- While calcium oxalate crystals are typically viewed as a defense mechanism against herbivores, their role in wound healing is less direct. However, some studies suggest that their presence may play a supportive role in maintaining the structural integrity of the healing tissue, contributing to the overall biological activity of the plant.

Mechanisms of Action in Granulation Tissue and Wound Healing

The process of wound healing can be divided into several stages, and granulation tissue formation is one of the most critical phases. During this phase, new tissue begins to form in the wound bed, setting the stage for the formation of a scar and eventual wound closure. *Katupila* aids in several aspects of this process:

1. **Promoting Inflammation Control and Collagen Synthesis**
   - The astringent properties of tannins reduce excessive inflammation by constricting the tissue and controlling fluid loss. This promotes a stable healing environment in the wound area, preventing prolonged inflammation that could otherwise delay healing.
   - Tannins also support collagen synthesis, a critical component in the formation of granulation tissue. Collagen acts as a scaffold that supports the growth of new tissue and blood vessels.

2. **Supporting Angiogenesis and Vascularization**
   - Flavonoids contribute to the angiogenesis process, ensuring the formation of new blood vessels. Granulation tissue requires a rich blood supply to deliver the nutrients, oxygen, and growth factors essential for tissue repair and regeneration.
   - The increase in nitric oxide produced by flavonoids improves blood circulation and stimulates the proliferation of endothelial cells, which are essential for the formation of new blood vessels within the wound.

3. **Enhancing Antioxidant Protection**
   - Antioxidant activity of both tannins and flavonoids protects the wound site from oxidative stress, reducing tissue damage and promoting the healthy development of granulation tissue. Oxidative stress can impair cell function and slow down the healing process, so the plant's antioxidant properties play an important role in preventing this.

Antibacterial Activity and its Role in Wound Healing[3]

A critical aspect of wound healing is the prevention of infection. The study reveals that *Katupila* exhibits strong antibacterial activity, particularly against Enterobacter aerogenes, a common multi-resistant pathogen in wound infections.

- The antibacterial properties of *Katupila* contribute to reducing microbial load in the wound, which helps in preventing secondary infections that can delay the formation of granulation tissue and tissue repair.
- By controlling bacterial growth, the plant ensures that the wound remains free from infection, creating an optimal environment for granulation tissue development and speeding up the healing process.

- **Active Constituents and Their Contribution to Wound Healing**

The methanol-water (80:20) extract of *Ficus leucopyrus* leaves contains several active compounds, including bergenin, which contribute to its wound-healing properties:

- Bergenin, an active compound, has shown significant antioxidant and immunomodulatory effects in vitro. By modulating the immune system and reducing oxidative stress, bergenin supports both inflammation resolution and granulation tissue formation.

CONCLUSION

Topical application of Katupila churna showed excellent wound healing efficacy in both the cases. The antibacterial activity and pharmacognostical profile ensures rapid development of healthy granulation tissue with no slough. The rare drug yielded truly miraculous result as the sinus tracts did not see any positive result with the previous interventions. Future research could explore different formulations of the drug for various types of wounds, potentially combined with internal administration.

Katupila showed significant wound healing activity by enhancing the treatment of chronic wound in our study. The antibacterial activity of Katupila extracts suggested that it can present grown several infectious pathogenic bacteria in vitro. Therefore, the antibacterial activity of Katupila can be one of the virtues contributing the wound-healing activity of Katupila plant. The present case series identifies the wound healing and antimicrobial properties of Katupila churna which can be promising for medical application.

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3. Antibacterial Virtue of Katupila (Securinega leucopyrus Linn) Contributes to its Wound –Healing Property Snehal Sonani1, Reshma Sonani2, 1 Shalya Tantra Department, Institute of Teaching and Research in Ayurveda, Jamnagar. 2 Departments of Microbiology, Gyanmanjari Science College, Maharaja Krishan Kumar Sinh Ji University, Bhavnagar-364002, Gujarat, India.