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UNDERSTANDING THE PROCESS OF BLOOD COAGULATION THROUGH PRAMANA (PANCHAVAYAVA VAKYA) - AN AYURVEDA VIEW

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ABSTRACT

As a Saiddhantika Shastra, Ayurveda accepts each theory or principle only after several scientific examinations through Pramana. In This context of the process of Rakta Skandana and Askandana, Panchavayava vakya has been utilised as a part of Anumana Pramana in proving the Process of Rakta Skandana (Blood coagulation). Acharya Sushruta mentioned four Rakta Skandana Upayas to stop excessive bleeding therapeutically. Physiologically, Rakta Skandana will occur through the same sequence of four steps, such as Dahana, Pachana, Skandana and Sadhana. This is proposed with one Drushtanta of the formation of a creamy layer over the surface of milk (**Ksheerat santanikavat iva).** As Rakta is a vital component, achieving Jeevana or Pranadharana is karma through several properties, among which the process of Skandana and Askandana is one. Therefore, the present work attempts to do the same, which will help us understand the concept and process of Rakta Skandana and Askandana.

INTRODUCTION

Ayurveda is a holistic science that provides guidelines regarding both *Swasthya rakshana* (Maintenance of health) and *Atura Prashamana* (Curation of disease). A comprehensive understanding of some essential components is needed to achieve this aim. *Rakta* is one such component which comes under

Saptadhatu, Dashaprana Ayatana etc. In the *Prakruta avastha, Rakta* will earn *Jeevana karma (Prana anuvartana*, i.e. supplies *Prana* to share). On the contrary, the virtual avastha of rakta causes various diseases. That's why Acharya Sushruta considered *Rakta* as one of the factors in *Shareera dharana karma* like *Tridosha*[2]. *Rakta* has specific *guna* and *karma*. Among them, Skandana and Askandana are the specific properties of Rakta that can be exhibited both physiologically and pathologically. *Rakta Skandana* & *Askandana* are inherent properties of the body, but in some pathological conditions, blood will get Skandata or lose the Drava guna and become solidified. This leads to life-threatening conditions like ischemic heart Disease, Ischemic stroke, DVT, etc. So, there is a need to understand the coagulation mechanism through an Ayurveda view for better management. In contrary to stop excessive bleeding, specific methods and medicines should be adopted. Acharya Sushruta mentioned these methods and medicines under *Rakta stambhana upayas*[2]. This concept, along with other fundamental concepts, helps to understand the Rakta Skandana & Askandana process using *Pramana (Panchavayava vakya).*

OBJECTIVE:

To conceptualise the process of blood coagulation *(Rakta Skandana)* as per the Ayurvedic view

MATERIALS & METHOD:

- Information about *Rakta Skandana & Askandana* (Blood coagulation and anticoagulation) was collected from Ayurveda and contemporary textbooks, published journals and research works.
- The study was conceptualised, analysed, and discussed critically, and conclusions were drawn based on *Pramana*.

Review of literature:

A literature review is a piece of academic writing demonstrating knowledge and understanding of the academic literature on a specific topic; here, in the context of the mechanism of *Rakta Skandana* and *Askandana*, the information regarding the same is available in a scattered manner, should be organised systematically, and it will be understood by *Pramanas* as follows.

Process of Blood Coagulation as per modern science

Blood coagulation is a process that changes circulating substances within the blood into an insoluble gel. The process requires **Coagulation factors, Calcium** and **Phospholipids**.

Either of two distinct pathways can initiate coagulation.

- Events within the lumen of blood vessels can initiate the Intrinsic pathway. The intrinsic pathway requires only elements (Clotting factors, Ca++, platelet surface, etc) found within or inherent to the vascular system.
- The Extrinsic pathway is the other route to coagulation. It requires tissue factors (Tissue thromboplastin) that are irrelevant to or do not normally circulate in the vessel. The tissue factor is released when the vessel wall is ruptured.

Definition of the word *Skandana* & *Askandana*

The definition of Skandana and Askandana needs to be clearly described in Samhita; based on the explanations available in commentary and descriptions from different texts with the help of Shabdakosha, these words can be defined as below.

Skandana

- **स्कन्दनं शोणितस्य स्त्यानीकरणं**| Su Su 14/39 (Dalhana Commentary)

स्त्यानं – स्निग्धम्, घनत्वम्

Solidification of blood is *Skandana.*

By the above definition *Skandana* can be defined as conversion of blood from liquid state to solid state.

- रक्तं स्कन्दयते हिमम्| - *Rakta Skandana* can be achieved by *Sheetopachara.*

Askandana

- **अस्कन्दि चेति स्त्यानत्वरहितम्| Su Su 14/21 (Dalhana commentary)**
- **अस्कन्दि-अस्त्यानम्, उष्णत्वात्। As Hri Su 27/40 (Arunadatta commentary)**

Absence of *Styanata (Ghanata)* is considered as Askandi, loss of ability of *Rakta* to convert from liquid state to solid mass.

Importance of Rakta Skandana

देहस्य रुधिरं मूलं रुधिरेणैव धार्यते |
तस्माद्यत्नेन संरक्ष्यं रक्तं जीव इति स्थितिः ||Su Su 14/44

Rudhira is *mula* (Utpatti, sthiti and pralaya) for *deha* and this will do *dharana karma* of *shareera*, so one should protect with effort.

Rakta is one among *Dashaprana Ayatana*, it serves the purpose of *Prana Anuvartana* (*Jeevana*). So, attracting save *Skandana* should be achieved therapeutically, and *Rakta* should be maintained in *Prakrita avastha*.

Methods of Rakta stambhana

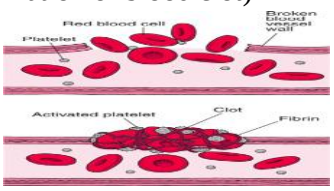
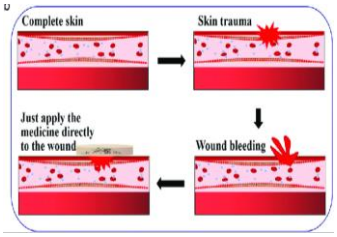
The process of Skandana is not explained directly in Ayurveda, but in the case of excessive bleeding, the four steps are described to prevent the bleeding by coagulation. They are as follows.

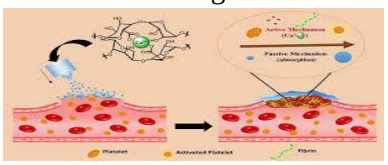
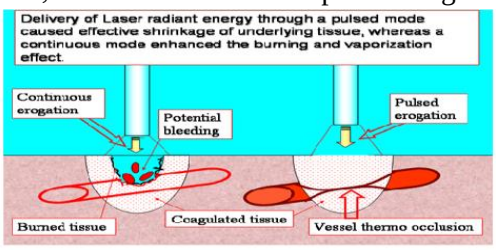
MODE	METHODOLOGY
Sandhana	*Kashaya rasa dravya (Ex – Lodhra etc)*
Skandana	*Sheeta*
Pachana	*Bhasma (Ex – Kshoumadi)*
Dahana	*Dahanakarma (Shalakadi)*

To stop *rakta Atipravrutti*, four techniques will be explained. They are *Sandhana, Skandana, Pachana* and *Dahana*. Sadhana can be achieved by Kashaya, Skandana by Hima, Pachana by Bhasma, and Dahana will stop at rakta Pravrutti by doing Sira Sankha.

DISCUSSION

In the classical texts, there is no clear-cut description regarding the process of *Skandana* and *Askandana*, by organising the concepts regarding the same and with support of other fundamental concepts. *Acharya Sushruta* mentioned four methods in the process of *Skandana* in the therapeutic aspect; these can also be taken as a process in physiological Skandana. Each method can be adopted based on the severity of the injury. Skandana is common in all the techniques. i.e. through *Skandana, Sandhana, Pachana* and *Dahana*, *Skandana* of Rakta can be achieved. Achieving *Rakta Stambhana* involves both actions on rakta and vrana avayava (Twak, Sira, etc.).

Methods	Mode	Justification
SKANDANA	*Hima (Sheetopachara)*	By doing *Sheetopachara, rakta* attains Styanata (Formation of blood clot) 
SANDHANA	*Kashayarasa dravya (Lodhradi)*	सन्धानं व्रणौष्ठादिसंयोजनम्| This can be compared to the action of Styptic. Styptic action is a specific type of antihemorrhagic agent that works by contracting tissue to seal injured blood vessel. 
PACHANA	*Pachana (Kshoumadi)*	Literally means absorption or digestion.

(Bhasma obtained from silk thread)		Haemostat materials absorb excel fluid by concentrating the natural clotting factors in the blood. 
DAHANA	*Dahana (Shalakadi)*	Cauterisation is the process which works by burning the blood vessels that are bleeding. This seals the blood vessels, which decreases or stops bleeding. 

- **PHYSIOLOGICALLY, THE PROCESS OF SKANDA CAN BE UNDERSTOOD BASED ON PANCHAVAYAVA VAKYA**

Physiologically, the process of *Skandana* can be understood based on ***Yoga, Vidhana Tantrayukti.*** Using ***Panchavayava vakya,*** **the process will be justified.**

PRATIJNA: The process of Skandana mentioned therapeutically by Acharya Sushruta, i.e. Dahana, Pachana, Skandana and Sandhana, will apply to the physiological *Skandana* process also.

HETU:

Steps	Process of creaming of milk (Ksheerat santanikavat iva)	Process of Skandana of Rakta
1	Heating of Milk	*Dahana* of *Rakta*
2	Boiling of milk	*Pachana* of *Rakta*
3	Cooling of milk	*Skandana* of *Rakta*
4	Creaming of milk	*Sandhana* of *Rakta*

The milk is heated, and when exposed to a cold environment, a thick, creamy layer will form over the surface of the milk.

DRUSHTANTA:

Image no - 01

When the milk is heated (Dahana), boiled (Pachana), and cooled (Skandana), a thick, creamy layer will form over the milk's surface (*Sandhana*).

UPANAYA: As milk, when heated, boiled and cooled, a thick creamy layer will form over the surface of milk in the same way Rakta, for many reasons, gets heated and cooked either naturally or therapeutically and when exposed to a cold environment or medication (*Sheetopachara*) leads clotting of blood.

NIGAMANA: Hence, the process of *Rakta Skandana* will occur in 4 steps: Dahana, *Pachana, Skandana, and Sandhana-like cream (Santana) formed over the* milk surface (*Santanika*). So, the process of *Skandana* mentioned therapeutically by Acharya Sushruta can also be adopted physiologically.

Note: When milk is heated, the water evaporates, and the other elements become increasingly concentrated. The protein–casein also tends to thicken once the milk reaches a temperature of about 150°. The evaporation of water and the coagulation of proteins work together to form a creamy layer on the surface of cooked milk. The thickness and chewiness of the coating are affected by how hot the milk is heated (Resulting in more evaporation and coagulation) and the fat content in the milk (Encouraging coagulation).

This can be justified with one example, i.e. *Plushta dagdha*. In *Plushta dagdha, the body gets sweat because of heat exposure, and the* same will be observed in the blood. During this state, water sprinkling leads to blood coagulation because of *Sheeta Guna*[3].

Coagulopathy in burn patients is considered to be driven by an endothelial injury, the release of tissue factors and inflammatory cytokines.

So, through the organised process of *Dahana* followed by *Pachana, Skandana, and Sandhana, Rakta* loses its fluidity then gets solidified, i.e., *Rakta* will attain *Skandata* (Coagulation of blood)

CONCLUSION

Skandana (Coagulation) and *Askandana* (Anticoagulation) are the properties of *rakta*. *Rakta Skandana* and *Askandana* will occur sequentially. The process of *Rakta Skandana, if viewed through the vision of Ayurveda, appears in a* series of four steps. They are *Dahana, Pachana, Skandana* and Sadhana. These are the four *Rakta Skandana Upayas* explained by Acharya Sushruta. This can be understood using *Panchavayava vakya* with the *Drushtanta* of the formation of *Ksheera santaanika*. How the cream over the milk will get formed like *Rakta Skandana* will occur. *Rakta Skandana* and *Askandana karma* will help maintain the homeostasis of the body. *Rakta* is considered a vital component of life through its *Jeevana (Pranadharana) karma*.

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