

CRITICAL APPRAISAL OF THE CONCEPT OF AVARTANA IN SNEHA KALPANA: A PHARMACEUTICAL AND PHARMACOLOGICAL REVIEW

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ABSTRACT

Background: The Ayurvedic pharmaceutical process for preparation of medicated oils (Taila) and ghee (Ghrita) is a lipid based system that can accommodate constituents obtained from herbal pastes and liquid media. Avartana is a specific type of medicated lipid modification in which a pre-made medicated lipid is used multiple times, each time with a different set of pharmaceutical ingredients. The classical texts describe that repeatedly processed Sneha is more therapeutic but the scientific basis and modern evidence for this have to be assessed. **Objective:** Critically discuss the classical concept, pharmaceutical methodology, physicochemical implications, pharmacological implications, existing analytical evidence in Avartana in Sneha Kalpana, its limitations and future research needs. **Methods:** The literature of classical Ayurvedic texts describing Sneha Paka and repeated processing was reviewed along with the contemporary literature on pharmaceutico-analytical literature of Avartita Sneha particularly Ksheerabala Taila. The evaluation of the evidence was carried out with respect to the process variables, organoleptic characteristics, physicochemical parameters, extraction phenomena, lipid-mediated drug delivery, quality control and possible mechanisms that may affect therapeutic performance. **Results:** Repeated processing results in progressive changes in colour, odour, consistency, moisture content and some physicochemical parameters which are revealed from available studies. The studies of Ksheerabala Taila and its repeated Avartana have shown that there is significant pharmaceutical transformation from one cycle to another, such as change in consistency and specific gravity, refractive index, acid value, saponification value and related parameters. However, no evidence exists to confirm that the more Avartanas the greater the therapeutic potency or that it penetrates the blood-brain barrier or has improved systemic bioavailability. **Conclusion:** Avartana can be understood as a traditional repeated processing method that has the potential to alter the composition and physicochemical features of lipid based Ayurvedic formulations. It is more correctly understood as a "pharmaceutical fortification" and a "matrix modification" rather than a linear increase in potency. Comparative studies of the phytochemical profile, lipidomic profile, chromatographic fingerprint, stability, pharmacokinetic and clinical evaluation should be standardized to prove the therapeutic benefits of the cycle.

KEYWORDS: Avartana; Sneha Kalpana; Avartita Sneha; Ksheerabala Taila; Ayurvedic pharmaceuticals; lipid-based formulations; Samskara; standardization.

1. INTRODUCTION

In Ayurvedic pharmaceuticals (Bhaishajya Kalpana), the pharmaceutical operations are used together and are collectively known as Samskara, which is a process by which the raw materials are converted into therapeutically useful dosage forms. Modification of the physical and pharmaceutical properties of medicinal substances: Heating, grinding, extraction, fermentation, impregnation and repeated processing.

Sneha Kalpana is an important dosage form in the group of lipid based dosage forms in Ayurvedic medicine. It is a process where a herbal paste (Kalka) is introduced into a lipid medium (Taila or Ghrita) which is heated in a controlled manner and the whole procedure is repeated with another aqueous or liquid medium prescribed (Drava Dravya). The presence of both the lipid and the aqueous phases creates a unique extraction environment that can result in interactions between constituents with different physicochemical properties and the final lipid matrix.

Avartana is a higher order application of repeated pharmaceutical processing. This procedure is carried out such that the medicated Sneha that is yielded at one processing cycle is used as the lipid medium in the next processing cycle and again processed with the prescribed ingredients. The number of repetitions can continue throughout several cycles, depending on the classical formulation.

Ksheerabala Taila is one of the common examples of Avartita Sneha. Multiple processing cycles have traditionally been employed in the preparations for Vata and therapeutic treatments such as Nasya, Abhyanga and internal administration. Its relevance to the pharmaceutical world, however, needs to be investigated more thoroughly. Descriptions of the therapeutic activity of traditional drugs cannot be directly translated into modern concepts like the increased bioavailability, nanosizing, blood–brain barrier penetration or increased pharmacological potency without experimentation. Thus, it is essential to have a critical appraisal that combines classical pharmaceutical principles with available analytical evidence.

2. Classical Basis of Sneha Kalpana and Avartana

The fundamental components of *Sneha Kalpana* are:

Sneha Dravya – the lipid phase, commonly Tila taila or Gritha;

Kalka Dravya – the herbal material processed into a paste; and

Drava Dravya – the liquid medium, which may include Kashaya, Ksheera, Swara or other liquids prescribed for the formulation.

A frequently applied general proportion is:

Component	General proportion
Sneha	1 part
Kalka	1/4 part
Drava	Generally 4 parts or as specified according to the formulation/process

The ratios should not be assumed to be interchangeable for all classical instructions as these can differ depending on the type and amount of liquid media used.

Controlled heating during Sneha Paka encourages the evaporation of the aqueous phase and interactions between the lipid, herbal paste and dissolved/dispersed constituents. Processing is stopped after the prescribed Sneha Siddhi Lakshanas, which are traditionally used as indicators of the end of the processing.

2.1 Concept of Avartana

Avartana is a product where the product from one cycle is processed again. The Avartita Sneha that is created in the previous cycle is then used as the base lipid for the next cycle, and new pharmaceutical ingredients are added as per prescription.

The generalized sequence can be written as:

Process: Sneha + Kalka + Drava → Controlled Paka → Siddhi Lakshana → Filtration → Avartita Sneha → Addition of fresh prescribed ingredients → Reprocessing → Subsequent Avartana.

Therefore, Avartana is distinct from just extending the duration of heating a single batch. It is composed of the cycles of extraction and processing, with the already-processed lipid being subjected to a new batch of material.

3. Pharmaceutical Interpretation of Avartana

3.1 Repeated Extraction

A possible pharmaceutical implication of Avartana is multiple exposure of the lipid matrix to the fresh herbal material. Another cycle to partition between the herbal and aqueous and lipid phase will occur with each cycle.

The process can thus affect the concentration and relative amount of extractable compounds in the final product. But it is not always assumed that extraction should go on without any end with each cycle. Eventual limits to further incorporation may occur due to saturation and/or chemical degradation, volatilisation, and changes in partition behaviour.

3.2 Biphasic Extraction Environment

Sneha Kalpana develops a complicated extraction system of aqueous and lipid phases during processing. Water-soluble compounds can initially be found in the aqueous phase, while relatively lipophilic constituents tend to interact with the oil phase.

As the water continues to evaporate, some of the constituents can be retained in the dissolved, dispersed, adsorbed or other associated form with the lipid matrix. This process can then be repeated, which may yield a different composition than the one resulting from a single extraction cycle.

3.3 Effect of Repeated Heating

Thermal processing is the key to Avartana and can have both positive and negative impacts.

Controlled heating can play a role in:

- Disruption and softening of plant tissues;
- Release of extractable constituents;
- Decrease in excess moisture;
- Concentration of non-volatile components; and
- Interaction of extracted compounds with the lipid matrix.

On the other hand, too much cumulative heat exposure can cause oxidation, hydrolysis, polymerization or degradation of heat-sensitive compounds.

Hence, the more the number of Avartanas, the higher the pharmaceutical quality is not necessarily implied.

4. Physicochemical Changes Associated with Avartana

Current pharmaceutico-analytical studies have demonstrated that processing of medicated oils more than once changes the measurable properties of these oils.

4.1 Organoleptic Characteristics

The most obvious effects are changes in colour and smell as well as changes in consistency. These characteristics have been found to change in different Avartana stages when studied comparatively with Ksheerabala Taila.

In one study, Ksheerabala Taila was processed through 7, 21, 50 and 101 Avartanas, with the observations of changes in consistency, colour and odour. The advanced cycles also showed changes of traditional Paka Siddhi.

4.2 Specific Gravity and Refractive Index

Specific gravity may also indicate variations in the overall composition of the lipid preparation, which may be due to the incorporation of extractives or other components.

Refractive index is also valuable to help identify compositional and property changes in oils. Analytical evidence of repeated processing and so affected lipid matrix is thus provided by the variation across Avartana stages.

However, these are non-specific parameters, which do not by themselves prove an increase in therapeutic activity.

4.3 Acid Value

Acid value is a measure of free fatty acids and is useful to assess hydrolytic changes in lipid preparations.

Since exposure to heat, moisture and plant materials is repeated in Avartana, it is possible that there are multiple competing mechanisms that can cause changes in acid value. As a result, the AV may not increase or decrease in a linear fashion with the increase of Avartana.

4.4 Saponification Value

The value of the saponification shows the average molecular properties of the saponifiable lipid fractions. Repeated processing may cause changes that may be due to a change in lipid composition, or to the presence of other lipid-associated substances.

4.5 Moisture and Loss on Drying

Usually, successive heating cycles tend to favor removal of water. Reduced moisture residual could contribute to physicochemical stability, but this cannot be determined by moisture content alone.

4.6 Oxidative Stability

Repeated heating creates an important pharmaceutical paradox. The loss of moisture and addition of antioxidant phytochemicals may have a positive effect on stability, while the cumulative effect of thermal exposure can have a negative effect on lipid oxidation.

Hence, it is recommended that peroxide value, p-anisidine value, total oxidation indices and long term stability should be examined throughout each of the Avartana stages and should not imply that repeated processing always leads to increased stability.

5. Ksheerabala Taila as a Model of Avartana

The preparation of Ksheerabala Taila is an experimental model which contains sesame oil, Bala and milk-based ingredients and a large number of formulations are described which are made by processing Ksheerabala taila through several Avartana.

Progressive change of physical attributes during processing of Ksheerabala Taila Avartana 101 was reported recently in a pharmaceutico-analytical study. On cooling, the preparation slowly became semisolid and the investigators credited this to some of the lipid components in the milk being incorporated during the repeated processing.

Measurable differences were also observed in the organoleptic and physicochemical parameters of Comparative investigations of Ksheerabala Taila and 7-, 21-, 50- and 101-times processed preparations.

The findings are relevant in the context of scientific evidence that Avartana is not only ritual repetition, but can also be used to gradually change the medicinal properties of the preparation.

Such results reflect pharmaceutical transformation in the first place, however, and not necessarily increased clinical efficacy. The latter must be done through pharmacological, pharmacokinetic and controlled clinical studies.

However, such findings demonstrate pharmaceutical transformation, not necessarily greater clinical efficacy. Establishing the latter requires pharmacological, pharmacokinetic and controlled clinical studies.

6. Potential Pharmacological Significance

6.1 Lipid-Mediated Delivery

Lipid-based drug-delivery systems can facilitate dissolution and absorption of certain poorly water-soluble compounds. From this perspective, *Sneha Kalpana* provides a scientifically possible pharmaceutical platform for carrying lipophilic phytoconstituents.

Repeated processing could modify the concentration and distribution of such compounds within the lipid matrix.

However, higher lipophilicity of the vehicle does not guarantee better bioavailability of all the ingredients. Comparisons of the different stages of Avartana via direct pharmacokinetic studies are needed.

6.2 Biological Membrane Interaction

Biological membranes are rich in lipids, and molecules that are compatible with lipids tend to have different membrane-partitioning properties than molecules that are very hydrophilic. This will give a theoretical ground to study Avartita Sneha as a lipid-mediated delivery system.

7. Pharmaceutical Advantages and Limitations

The possible pharmaceutical benefits of Avartana are repeated exposure to the fresh medicinal material, modification of the lipid matrix, possible enrichment of selected extractable constituents, reduction of residual moisture and possible development of concentrated formulations.

There are major manufacturing constraints that must be considered for these benefits.

The processing in the higher order Avartana is long, it takes a lot of raw material, it needs to be filtered several times, labour is heavy and heating endpoints need to be monitored closely. As the number of cycles increases, it becomes more difficult to obtain batch to batch reproducibility.

Material can also be lost due to adherence to processing vessels, material being stuck in the Kalka, filtering, transferring between containers and handling. On the other hand, formulations that include milk or other media that provide lipids could show lipid mass recovery during specific phases. The behaviour of yield is therefore dependent on the formulation and should not be said to be progressive loss in general.

The repeated thermal processing also poses concerns about oxidation and degradation of thermolabile components.

8. Critical Appraisal of the Existing Evidence

The evidence available so far suggests that:

Avartana brings about a real pharmaceutical transformation.

It is not yet known if adding more Avartanas always results in:

1. Increased amounts of compounds of therapeutic value;
2. Greater systemic bioavailability;
3. Superior tissue distribution;
4. Better blood–brain barrier penetration;
5. Pharmacological activity is higher proportionately;
6. Clinically significant dose reduction; or
7. Superior therapeutic efficacy.

The majority of published investigations are still of the pharmaceutico-analytical rather than pharmacokinetic or clinical type. Sample sizes and batch replications are often small and analytical methods are diverse.

Therefore, traditional claims should be explored more into pharmacological findings.

9. Implications for Standardization

Industrial and regulatory standards for Avartita Sneha need much more than just determining the number of processing cycles.

The following should all be considered critical process parameters:

- Quality and quantity of raw materials;
- Sneha-Kalka-Drava proportions;
- Amount of ingredients added to each cycle;
- Heating temperature and heating profile;
- The number of Paka; and
- Endpoint determination;
- Filtration conditions;
- Intermediate and final yield;
- Processing time for the entire process.
- Storage conditions.

Organoleptic properties, specific gravity, refractive index, acid value, peroxide value, iodine value, saponification value, moisture content, chromatographic fingerprint as well as suitable marker compounds should be included in critical quality attributes.

The classical Sneha Siddhi Lakshanas along with validated instrumental parameters could give a more standardized approach in modern times.

10. CONCLUSION

Avartana is a unique repeated-processing technology in Ayurvedic Sneha Kalpana. From classical pharmaceutical reasoning and emerging analytical evidence, it can be concluded that physical, chemical and organoleptic properties of medicated lipid formulations undergo successive modifications during successive processing.

The present studies, including the use of Ksheerabala Taila, have shown that repeated Avartana can cause significant alterations in the consistency and physicochemical parameters. The observations are consistent with the view that the Avartana process is a true pharmaceutical transformation and not just repetition of processes.

At this time, however, it is not possible to assume that the more the processing cycles, the more potent the product will be, and that it will be able to penetrate the blood–brain barrier. Avartita Sneha is also classified as a nanomedicine, and a direct physicochemical evidence needs to be provided for this.

Avartana is therefore a process, and an interpretation of Avartana, based on the scientific approach, should consider it as a process of pharmaceutical fortification and matrix modification, which takes place in cycles and whose therapeutic effects have yet to be quantified.

Future research work incorporating pharmaceutical standardization, chromatographic and metabolomic characterization, lipid chemistry, pharmacokinetics, pharmacodynamics and controlled clinical evaluation may help to determine if there is an optimal range for Avartana and how classical repeated-processing technology can be transferred to a reproducible and evidence-based Ayurvedic pharmaceutical practice.

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