

Snehana And Swedana In Contemporary Clinical Context: A Critical Review Of Biomedical Mechanism And Safety Considerations.

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ABSTRACT

Background: *Snehana* (Oleation) , *Swedana* (Sudation) are key therapeutic procedures in *panchakarma* employed as preparatory therapy for detoxification as well as standalone procedure to restore systemic balance. In contemporary clinical practice their application has expanded in managing metabolic, inflammatory, musculoskeletal, stress related illnesses, however rise in patients with comorbidities and concomitant medication usage, necessitates a clearer understanding of their biomedical mechanisms along with potential drug interaction, safety considerations.

Objective: To critically review and synthesise available evidence on biomedical mechanisms and safety considerations associated with *Snehana* and *Swedana* in contemporary clinical context.

Methods: A critical narrative review with structured literature search was conducted using electronic indexed databases like PubMed, Scopus, google scholar, web of science. Studies involving *snehana* and *swedana* treatment, reporting measurable biomedical, clinical outcome were included. Data was analysed & summarized in terms of study design , interventions , outcomes , safety reporting.

Results: The reviewed evidence suggests that *snehana*, *swedana* produces multi system effects on cardiovascular, metabolic, neuro-endocrine axis and inflammatory pathways. Although accompanied by transient hemodynamic, thermoregulatory, cardiovascular changes which highlights potential safety implications.

Conclusion: *Snehana*, *swedana* exhibits significant multi systemic effects, supporting their therapeutic potential in contemporary practice. Careful patient monitoring, standardized treatment protocol, adjustment of concomitant medications if needed are essential to ensure safety. further high-quality studies are required to establish definitive mechanism and standardized clinical guidelines.

Keywords: *Snehana*, *Swedana*, *Snehapana*, Biomedical Mechanism, Passive Heat Therapy, Narrative Review

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INTRODUCTION

Snehana (oleation), *swedana* (sudation) has pivotal fundamental role as preparatory procedure which also can be the standalone intervention or part of multimodal *panchakarma* protocol in wide range of clinical

conditions. *Snehana* (oleation) involves administration of lipid based substance like medicated ghee, oil internally or externally to facilitate lubrication and mobilisation of vitiated *doshas* (bodily humors) while *Swedana* employs induced perspiration through various

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passive heat based techniques thereby dilating *Srotas* (channels of circulation), relieving stiffness, bringing dislodged doshas into *koshtha* (main channel i.e. GIT) for further elimination.

In contemporary clinical settings *snehana* (oleation) *swedana* (sudation) are used in management of musculoskeletal ailments, metabolic diseases, stress related illnesses. These are routinely used in *panchakarma* procedures. With rapidly growing patient population presenting comorbidities like cardiovascular disease, hypertension, diabetes, chronic inflammatory joint disease, these therapies are used along with concomitant medications, thence raising need to understand potential interactions, physiological responses.

Despite of widespread use, the biomedical mechanism pertaining to *snehana* (oleation) *swedana* (sudation) remain inadequately characterised. While emerging evidences showed effects on cardiovascular, neuroendocrine, metabolic & inflammatory pathways; these mechanisms have not been systematically analysed in contemporary scientific terms. Additionally in patients with comorbidities, safety considerations are not consistently reported, variability in study design, intervention protocol, assessment parameters reporting further adds to heterogeneity, limiting ability to draw robust conclusion.

This review critically analyses available literature to deduce biological mechanisms underlying *snehana* (oleation) *swedana* (sudation) to evaluate their safety considerations in contemporary clinical settings

MATERIALS AND METHODS

Literature screening of indexed articles from reliable databases like PubMed, Scopus, Web of Science, Google

Scholar etc were utilized for critical review. Material related to *snehana* (oleation) *swedana* (sudation) obtained through an online search using Boolean operators such as AND, OR, NOT. Search term included “*Snehana*” “*Swedana*” “Internal Oleation” “*Panchakarma*”. Studies comprising of *snehana* (oleation) *swedana* (sudation) were only included if they reported physiological or measurable clinical outcomes. Data charting was done based on study design, sample size, type of intervention, outcomes, safety considerations and study limitations.

RESULT

This narrative review included total 15 studies consisting of randomised controlled clinical trial, observational studies & case reports. Included studies were of *snehana* (oleation) *swedana* (sudation) , multimodal *panchakarma* studies comprising of them. The studies included varied in study designs and population characteristics, across various disease conditions including cardiovascular disease, musculoskeletal disease, stress related conditions & metabolic diseases. Outcomes measured various biochemical, metabolic profiles and hemodynamic parameters. Concomitant medication reporting was erratic across studies. While some of the studies mentioned continuation of standard treatment, others did not report drug usage and their potential influence on treatment outcome. Inconsistency was observed in terms of continuation, withdrawal, dose adjustment. Interpretation as per medication usage was largely absent. This limits the probable effects of analysis of therapy.

Table 1: characteristics of included studies on snehana and swedana

Author(year)	Design	Sample size	Intervention	Key findings	Safety reporting	Major limitation
S.Rahul At El.(2018) ^[1]	Prospective Single Arm Interventional Clinical Study	CHF Patients N = 52	<i>External Sarvanga Abhyanga Sarvanga Parisheka</i>	Partial Improvement In Lipid Levels, Improvement in Ejection Fraction, Maximum Aerobic Capacity	No Major AE Reported	Multimodal Protocol, Small Sample Size, Lack Of Control Group, Short Follow-Up, Restricted Population (CHF,EF) Requires Larger & More Diverse CHF Population
Kessler C.S. Et Al ^[2]	Randomized, Controlled, Open-Label Trial	Knee OA N= 151	<i>Sarvanga Abhyanga</i>	Ayurveda Intervention Led To Significant Improvement	Yes Related To Locomotor System, Skin	Open Labelled ,Complex Multimodal Intervention

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				nt in Pain and Functional Outcomes In Knee OA		
Rohit S. Et Al ^[3]	Randomization Open Labelled Clinical Trial	CHF Patients = 70	<i>Abhyanga Bashpa Sweda Hrudayadhara</i>	Improvement In METS(Metabolic Equivalent Of Tasks), Oxygen Uptake & Cardiac Measures	AE Reported Lower Respiratory Tract Infection Upper Respiratory Tract Infection Pain in Cubital Fossa Chest Pain	Multimodal Therapy, Small Sample Size, Open Label Design
Peterson C Et Al ^[4]	Prospective Controlled Pre-Post Intervention Cohort Study	Healthy Subjects N= 119	<i>Abhyanga Bashpa Sweda/Nadi Sweda</i>	Significant Changes in Plasma Metabolic Profiles	No Major AE Reported	Non-Randomized Design, Multimodal Panchakarma Intervention, Short Treatment Period
Rastogi S, Verma A. Et Al ^[5]	Prospective Single Arm Interventional Clinical Study	Rheumatoid Arthritis N = 94	<i>Sarvanga Abhyanga Saidhava Valuka Sweda</i>	Significant Reduction in DAS28-ESR, Significant Changes In Metabolic Profiles	No Major AE Reported	Non-Randomized Design, Small Sample Size And Lack Of Control Group
Kumar T. Et Al ^[6]	Randomized Comparative Clinical Trial	Low Back Ache (Katigraha) N = 36	<i>Sthanik Abhyanga, Upnaha Sweda</i>	VAS, ROM, Oswestry Disability Index(ODI)	No Major AE Reported	Small Sample Size, Short Treatment Duration
Yadav M. Et Al ^[7]	Case Report	Dyslipidemia N=1	<i>Kuti Sweda</i>	Improvement Seen In Lipid Levels, Weight Reduction, Improvement In Breathlessness, Lethargic Condition	No Major AE Reported	Single Case Report, Cannot Be Generalised
Rastogi S. Et Al ^[8]	Pilot Observational Study	Patients Undergoing Sarvanga Swedana N= 42	<i>Sarvanga Abhyanga Bashpa Sweda/Nadi Sweda</i>	Rise In Bp During Swedana, Reduction to Basal Value After 5 Mins of Monitoring, Increased Body Temperature, Sweating, HR, PR	No Major AE Reported	Confounding Factors Present, Pilot Study, Small Sample Size

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Goyal R.Et Al ^[9]	Open Label Clinical Trial	Sthoulya (obesity) N=80	<i>Valuka Sweda</i>	Significant Reduction in Body Weight By 1.61 Kg (1.9%) And In BMI By 1.88%, Significant Reduction In PR, Circumference Of Midarm, Abdomen, Chest, Hip, Reduction In Eosinophil Count, Sr TG, Sr. LDL	No Major AE Reported	Small Sample Size, No Blinding
Patil S. Et Al ^[10]	Randomized, Parallel And Open Labeled Interventional Clinical Trial	Eczema, Leucoderma, Acne, Psoriasis And Healthy Volunteers N= 29	<i>Sarvanga Abhyanga</i> , <i>Bashpa Sweda</i> , <i>Snehapana</i>	Improvement In The Appetite, Changes In The Bowel As Per The Dosage Of Snehapana, Lipid Increases Initially And Will Be Back To Normal After Purification	No Major AE Reported	Small Sample Size And Lack Of Methodological Rigor, Multimodal Intervention
Muley Monica ^[11]	Open Label Observational Perspective Clinical Study	Healthy Candidates N=30	<i>Sarvanga Abhyanga</i> , <i>Snehapana</i>	Reduction In Tg And Vldl, Reduction In Abdominal Circumference, Weight.	No Major Ae Reported	Small Sample Size ,Short Follow Up Period, Multimodal Intervention
Jane P.U Et Al ^[12]	Open, Uncontrolled, Prospective Clinical Study	Individual Posted For Snehapana N = 10	<i>Snehapana</i>	No Significant Change In Hematological Parameters, No Considerable Rise In Lipid Levels	No Major AE Reported	Small Sample Size Observational Study

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K.Paresh Et Al ^[13]	Covariate Adaptive Randomization	Individual Posted For Shodhanartha Snehapana N= 68	<i>Snehapana</i>	Amurchita tiltaila snehapana Resulted In 5% & 3 % Increase In Both Fasting And Postprandia l Blood Sugar Level, Muorchitati itaila Showed 3% Increase In Fasting Blood Sugar Leve Lbut Decreased In Postprandia l Bloodsugar Level, Significant Change In Clotting Time Observed In Atasi Taila,Murch ita Tiltaila Showed A Significant Decrease In Serum Albumins In Comparison Between Before And After The Snehapana	No Major AE Reported	Lack Of Control Group, Lack of Methodolgical Rigor, Incomplete Reporting of Data
B.Annetrin,B A Et Al ^[14]	Pilot Clinical Study	Healthy Adults Undergoing Stress N= 20	<i>Sarvanga Abhyanga</i>	Reduction In HR Was Found	Monitored No Major AE Reported	Pilot Design, Small Sample Size and Follow Up Period
Sharma A Et Al ^[15]	Case Report	Anxiety N=1	<i>Abhyanga Dashamoola Ksheer Shirodhara</i>	Serum Cortisol Significant Reduction After Therapy	No Major AE Reported	Single Case Report , Lack of Follow Up

Hemodynamic and vascular changes

Studies related to *swedana* (sudation) reported transient increase in blood pressure, heart rate, peripheral

circulation. There was compensatory increase in cardiac output. These changes returned to baseline shortly after the intervention.

Thermoregulatory changes

Swedana (sudation) procedure increases perspiration, activating thermoregulatory responses, vasodilation of skin to initiate heat dissipating mechanism.

Lipid metabolism modulation

Snehapana (internal oleation) studies reported no significant increase in lipid profile, suggesting improved metabolism responses. This suggests modulatory rather than accumulative response of *snehapana* (internal oleation)

Anti-inflammatory and musculoskeletal effects

Various studies reported reduction in symptoms comprising of pain, stiffness, improved mobility in musculoskeletal symptoms demonstrating anti-inflammatory, analgesic potential of *snehana* (oleation) *swedana* (sudation)

Neuroendocrine and stress modulation

There were limited studies evaluating effect of *shirodhara* (pouring medicated liquid on head) *abhyanga* (massage) related therapy in reduction of serum cortisol, stress promoting relaxation, improvement in subjective stress parameters and anxiety.

Metabolic and systemic detoxification effects

Multimodal *panchakarma* intervention showed changes in biochemical profile, metabolomic studies suggested modulation in metabolic pathways indication broader systemic effects of intervention.

Safety and adverse events reporting

Most studies reported minimal to no adverse events, however there was lack of reporting of safety parameters, monitoring plans were not described in cases of hypotension, hypoglycemia, dehydration, other potential risk factors.

Table 2: proposed physiological effect and biomedical mechanisms and safety considerations during snehana and swedana

Physiological effect	Procedure	Evidence from included studies	Proposed biomedical mechanism	Safety consideration
Hemodynamic and vascular changes	<i>swedana</i>	Studies evaluating <i>sarvanga swedana</i>	May involve heat induced peripheral vasodilation, increased blood flow ,compensatory elevation in cardiac output with increased heart rate, transient changes in blood pressure ^[16]	Requires careful monitoring in patients with cardiovascular pathologies due to potential increase in cardiac output and hemodynamic alterations
Thermoregulatory changes	<i>swedana</i>	Studies involving <i>swedana</i>	Elevations in skin and body core temperature activate the thermoregulatory centers in the hypothalamus to initiate sweating and vasodilation of the skin to dissipate heat.	Excessive sweating may lead to risk of dehydration due to fluid loss,electrolyte imbalance,heat intolerance,cardiac instability
Lipid metabolism modulation	<i>Snehapana</i>	Studies evaluating lipid profile changes during <i>snehapana</i>	May influence metabolism of lipids through choleric effect ,mobilization of lipids ,utilization of fat stores without significantly increasing serum lipid profile	Considered safe, monitoring may require in patients with severe dyslipidemia and metabolic disorders
Anti-inflammatory and musculoskeletal effects	<i>Snehana, swedana</i>	Clinical trials involving musculoskeletal diseases	Snehana reduces the stagnation of blood or fluid facilitates lymphatic and venous flow.it it improves blood supply via vasodilation, improves soft tissue elasticity and removal of metabolic waste thereby reducing	Generally safe, caution can be taken in cases of acute inflammation,skin diseases,recent fractures.

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			<p>pain and stiffness.^[17] Swedana enhances microcirculation by vasodilation, passive heating may activate immune pathways by stimulating IL-6 release, activating immune pathways, resulting in transient pro-inflammatory phase followed by anti-inflammatory compensation that may reduce chronic low-grade inflammation^[18]</p>	
Neuroendocrine and stress modulation	<i>Snehana (Abhyanga), shirodhara</i>	Studies measuring stress or serum cortisol	<p>Shirodhara probably normalizes the two important neurotransmitters Serotonin, Norepinephrine leading to relaxation, lowering stress levels.^[19] Abhyanga may modify neuroendocrine function, influence parasympathetic activity thereby promoting relaxation, stress reducing serum cortisol levels.</p>	<p>Considered safe, caution may be required in severe psychiatric cases, altered neurological condition.</p>
Metabolic and systemic detoxification effects	<i>vaman, virechana</i> protocol which includes <i>snehana, swedana</i>	Studies evaluating systemic biochemical changes	<p>Multimodal intervention including snehana, swedana may regulate metabolism through mobilization of</p>	<p>Generally safe, monitoring is required in electrolyte imbalance, impaired metabolic profile</p>

			lipids, increasing circulation and perspiration, elimination of metabolic wastes thus bringing changes in biochemical profiles.	
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DISCUSSION

This review evaluated biomedical implications and safety consideration associated with *snehana* (oleation) *swedana* (sudation) in contemporary clinical practice. These interventions demonstrated multisystem effects on hemodynamic, thermoregulatory, neuroendocrine, metabolic, musculoskeletal system. Nevertheless, despite of emerging evidence, significant gaps remain in reporting of safety and methodological standardization. Hemodynamic and vascular responses observed in *swedana* (sudation) are consistent with physiological adaptations to passive heat therapy. Increase in body temperature leads to cutaneous vasodilation which in turn increases blood flow, redistribution of blood from central to peripheral circulation. This shift is accompanied by reduction in central venous pressure, increasing cardiac output compensatorily with elevation in heart rate. These changes indicate controlled cardiovascular stress, similar to moderate level exercise. The transient increase in blood pressure, pulse rate was observed which immediately returned to baseline post procedure. Repeated exposure to such heat may induce long term vascular adaptations, improved endothelial function, blood pressure however these effects have safety implications. In patients with pre-existing cardiovascular conditions caution should be taken.

Thermoregulatory response observed during *swedana* (sudation) are governed by activation of cutaneous thermoreceptors which transmits signal to hypothalamic control center initiating autonomic responses due to heat exposure. These mechanisms stimulate activity of eccrine gland, vasodilation of cutaneous blood vessels increases peripheral circulation, while sweating facilitates heat dissipation via evaporation. These processes collectively maintain thermal homeostasis. Chronic exposure to *swedana* (sudation) improves thermoregulatory adaptations including earlier onset of sweating, vascular reactivity, improved heat tolerance. There are important safety implications, increased sweating may lead to electrolyte imbalance potentially leading to dehydration. In high humid conditions there is a risk of overheating which may contribute to fatigue, dizziness hence monitoring is required in vulnerable population.

Snehapana (Internal oleation) regulates lipid metabolism rather than significant elevation in lipid profile. During *snehapana* (Internal oleation) there is reduced carbohydrate intake, in this case fatty acids

derived from lipids undergo digestion, absorption, β -oxidation, in turn leading to production of acetyl-coA, which is a source of energy generation. Also, bile salts emulsify lipids, facilitates absorption, excretion of cholesterol, certain metabolic wastes. There might be transient increase in lipid levels which is due to mobilisation of stored lipophilic substance rather than pathological hyperlipidaemia. As per ayurveda the disease is produced due to dislodgement of vitiated doshas in *srotas* (channel of circulation) in body. During *snehapana* (Internal oleation) the *ghrita* reaches into each cell of the body and toxins from the cells diffuse back into *ghrita* medium through active and passive transportation which is further eliminated by *shodhana* (Detoxification).^[1] monitoring should be done in individuals with metabolic dysfunction, severe lipid profile alterations.

Snehana (oleation), *swedana* (sudation) shows significant improved in anti-inflammatory and musculoskeletal benefits through clinical findings. *snehana* (oleation) enhances local circulation, muscle relaxation, facilitates venous and lymphatic drainage. Massage manoeuvres applied during *abhyanga* reduces stiffness, improves tissue elasticity, increases joint motility. *swedana* (sudation) through passive heating mechanism increases circulation through vasodilation thus improving blood flow. This helps in reducing muscular spasm, stiffness, modulate inflammatory responses through cytokine-mediated pathways. As per ayurveda classics, pain, degenerative changes are caused due to vitiation of *vata*, *Snehana* (oleation), *swedana* (sudation) does *vata shamana* thereby improves the mobility of joints and relieves the pain associated symptoms. Excessive pressure during *abhyanga* may cause tissue strain, discomfort. Similarly during *swedana* (sudation) excessive heat may cause heat intolerance, discomfort in sensitive individuals.

Abhyanga stimulates cutaneous receptors, promotes parasympathetic activation leading to reduction in stress markers such as cortisol, this improves sleep, anxiety, subjective stress. *Shirodhara* (pouring of medicated liquid on head) shows significant influence on hypothalamic pituitary adrenal axis, continuous rhythmic flow of the medicated liquid on the forehead may induce somato-autonomic reflex through thermosensors in the skin or hair follicle via trigeminal nerve. leading to maintenance of psycho-physiological balance.^[20] Stress can be correlated with *Atichinta*

(Excessive thinking) which is caused due to *rasavaha strotas dushti*, *shirodhara* (pouring of medicated liquid on head) produces calming effect on mind through above mechanisms. precaution to be taken to maintain the temperature of the flow.

multimodal *panchakarma* intervention shows systemic effects, evidence from studies on metabolite profile demonstrates reductions in pro inflammatory metabolites like succinate, lysine, glycine, histidine along with normalising amino acid levels which improves mitochondrial functions, tissue metabolism. These findings indicate enhanced metabolic clearance, reduction in inflammatory mediators. From Ayurveda perspective these mechanisms can be correlated to *ama* (Toxic byproduct) this gets accumulated and vitiates doshas causing *srotodushiti*. *Snehapana* (internal oleation) facilitates metabolism of lipids and toxins from tissues whereas *swedana* (sudation) causes mobilisation of metabolite into the gastrointestinal tract for elimination through enhanced circulation, thermoregulation. *shodhana* (detoxification) eliminates such metabolic wastes from the body restoring normal function.

Major limitation of the study was inadequate reporting of safety parameters. Evaluated study reported minimal to no adverse events. There was inadequate reporting of standardized protocol for monitoring pre and post procedure, lack of long term follow up. Risk factors such as hypotension, dehydration, hypoglycaemia were not assessed systematically. These concerns highlight the need for more rigorous approach.

An important finding of this critical review was inconsistent reporting of concomitant medication. Many studies did not document whether concomitant medications continued along therapy nor acknowledge potential interaction between modern drugs, *panchakarma* procedures, dose modification. This points towards confounding bias and dilutes interpretability of clinical outcomes. In contemporary settings *panchakarma* therapies are used along conventional treatments, future studies must practice detailed reporting and analysis of potential drug therapy interactions.

The included studies demonstrated heterogeneity in terms of study design, interventional protocols, assessment criteria. Many studies had small sample size, case reports which further limited generalizability. Strength of this lies in its integrative approach, distilling biomedical pathways with clinical observation, underscoring critical gaps in safety, procedural inconsistencies.

Future research should give priority to standardized treatment protocol along with well designed clinical trials, detailed safety protocol, concomitant drug reporting. Integrative approach incorporating biochemical, physiological approach may further elucidate the systemic effects of these therapies.

CONCLUSION

Emerging evidence suggests that *panchakarma* through *snehana* (oleation), *swedana* (sudation) exerts integrative effects on metabolic, inflammatory, neuroendocrine pathways indicating its potential as system based therapeutic approach, though further studies are needed to confirm these findings.

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