

A CRITICAL REVIEW OF SANDHANA KARMA

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ABSTRACT

The word *Sandhana* refers to join, union, combination, restoration, and repair. *Sandhana karma* cannot be limited only to *Bhagna sandhana*. It needs to be understood at the level of *dhathus*. *Sandhana karma* also refers to repairing, restoring, and maintaining connective tissue. Thus, it needs to be reviewed under different conditions. This study aims to carry out a critical understanding of *Sandhana karma* at the level of *saptha dhathu*. Data was collected from *Ayurveda* classical texts and journal and research articles. Finally, gathered data were critically analysed. *Sandhana karma* at the level of *Rasa dhathu* can be understood as '*twachya karma*', which may be correlated to maintaining normal skin tone and elasticity. *Raktha dhathu* acts through *stambhana/skandhana*, i.e, haemostatic /coagulant activity. *Mamsa dhathu* refers to *Vrana oshtaadi seevana*, i.e, suturing of injured muscle tissue. In *Medo dhathu*, *Sandhana karma* can be considered the restoration of an articular joint as sandhi is one of its *upadhathu*. In *Asti dhathu*, it is *Bhagna sandhana*, i.e, healing and union of fractured bones. *Majja dhathu* refers to restoring bone marrow fluid possessing osteogenic and osteoinductive properties, promoting bone union. In *Shukra dhathu*, *Sandhana* refers to maintaining sperm plasma membrane and acrosomal integrity, which is necessary for motility and fertilisation. The literature revealed that *dravyas* possessing *Sandhana karma* with a varied combination of *Rasapanchaka* gives scope for the utility of *sandhaneeya dravya* in specific conditions at the level of *saptha dhathu*.

Keywords: *Sandhana karma, Sapta dhathu, Sandhaneeya Dravya.*

INTRODUCTION

Sandhana means *Samhati*, *Samyojana*, *Sangrahana*, *Samhanana* and *Sanghattana*.¹ *Sandhana* refers to Union, Joining, Combination, Restoration, Repair and Maintaining the integrity of body parts and connective tissues.² *Sandhana karma* cannot be limited only to *Bhagna sandhana*. It needs to be understood at the level of *Dhathus*. Around 30 *Sandhaneeya Dravyas* have been mentioned in *Charaka Samhita* and different *Nighantus* with varied *Rasa panchaka*.

Sandhana karma needs to be reviewed under different conditions.

AIM

- To carry out a critical understanding of *Sandhana karma* at the level of *Saptha dhathu*.
- To explore *Sandhaneeya Dravya*, which has a specific action on *dhathu*.

CRITICAL UNDERSTANDING OF SANDHANA KARMA IN SAPTA DHATU

1. RASA DHATU

The *Poshanamsha* of *twak* is derived from *rasa dhathu*; hence, *rasa dusti* directly influences *twak*.³ *Dravya*,

1. MADHUKA: *Glycyrrhiza glabra* linn. – Fabaceae



- Antiaging and Antiwrinkle potential of *Glycyrrhiza glabra*, Eicosanyl and docosyl caffeate, two long-chain caffeoyl esters isolated from *G. glabra* roots showed a potent elastase inhibitory activity, target to prevent aging and wrinkles formation.⁵
- Antioxidant, antiaging and antiwrinkle effect of *G. glabra* acts b inhibition of MMP-2 activity along with the consequent increase of collagen production.⁶

having karmas like *Sandhaneeya*, *Rasayana*, *Varnya*, and *Twachya*, helps repair and restore damaged cells.

The inevitable intrinsic skin ageing is due to physiological ageing characterised by the decline of collagen, elastin, & Hyaluronic acid levels, leading to a loss of strength & flexibility in the skin, which results in variable wrinkles associated with the thickened epidermis, moulted discolouration, laxity, dullness & roughness of the skin.⁴

***Sandhana karma* at the level of *Rasa dhathu* can be understood as ‘*Twachya karma*’, which may be correlated to maintaining normal skin tone and elasticity.**

Sandhana karma in *Rasa dhathu* includes Pharmacological activities like.

- Antioxidant, anti-hyaluronidase, anti-tyrosinase, anti-ageing, anti-wrinkle [anti-collagenase and elastase]

2. ARJUNA: Terminalia arjuna linn. - Combretaceae



- Pentacyclic triterpenoids from Terminalia arjuna show multiple benefits on aged and dry skin by improving Collagen synthesis and epidermal barrier function.⁷
- Anti-ageing ability of Terminalia species with special reference to hyaluronidase, elastase inhibition and collagen synthesis- in vitro by provide the necessary supplies for the cells to maintain and promote their proliferation and to produce their constituents like collagen.⁸

2. RAKTA DHATU

Sandhana karma is one among *Rakthastambana Upaya*.⁹

Dravyas with a predominance of *kashaya rasa* aid in vasoconstriction or stimulate the prothrombin net formation, which helps trap the platelets at a site of injury, thus reducing the bleeding time.

***Sandhana karma* at the level of *Rakta* can be considered as Haemostatic and Coagulant activity.**¹⁰

1. LAJJALU: Mimosa pudica linn. - Fabaceae



- Phytochemical analysis and invitro hemostatic activity of Mimosa pudica extracts, contains tannins and flavonoids which trigger blood coagulation.¹¹
- Mimosa pudica, its medicinal value and pilot clinical use in patients with Menorrhagia: as shown effective coagulant activity.¹²

2. LODHRA: Symplocos racemose roxb. -Symplocaceae



- Review on *Lodhra* (*Symplocos racemose*) in the management of *Rakthapitta* (bleeding disorder)¹³, Symposide is a new anti-fibrinolytic glycoside from *symplocos racemose*.¹⁴
- Comparative clinical study on the efficacy of *Amaranthus viridis* and *Symplocos racemosa* in *Asrug-dara* with spr to Menorrhagia: proven effective coagulant activity.¹⁵

3. MAMSA DHATU

Sandhana karma refers to reconstructing a cut or injured body part with a particular focus on *Nasa*, *Karna*, and *Oshta Sandhana*.¹⁶ *Sandhana karma* includes *Seevana karma* (suturing) and *Vrana oshtadi Sanyojanam*¹⁷ as *mamsa* is one of the *dushya* involved in *Vrana*.¹⁸ *Sandhana karma*, one among *Shasti upakrama*, is an ideal treatment protocol for wound healing.¹⁹

***Sandhana karma* at the level of *Mamsa dhathu* can be correlated to the Suturing of injured muscle tissues and Wound healing activity.**

1. BILVA: *Aegle marmelos* Linn. - Rutaceae



- *Aegle marmelos* is known to promote the wound healing process, mainly due to their astringent and antimicrobial properties, responsible for increased rate of reduction in wound area of epithelialization.²⁰
- In Vivo Healing Potential of *Aegle marmelos* in Excision, Incision, and Dead Space Wound Models: *Aegle marmelos* fruit pulp seemed to be effective due to decreased free radical and myeloperoxidase generated tissue damage, promoting effects on antioxidant status, faster collagen deposition as evidenced by increase in collagen determinants and decrease in inflammation confirmed histopathologically.²¹

2. PRIYANGU: *Callicarpa macrophylla* vahl. - Verbenaceae



- Wound healing activity of ethnolic extract of *Callicarpa macrophylla*.²²: The ethanolic and aqueous extracts of *Callicarpa macrophylla* showed significant ($p < 0.05$) anti-inflammatory effect in the acute phase of the inflammation process.

4. MEDO DHATU

- *Snayu* and *Sandhi* are the *Upadhathu* of *Medas*. Its essential functions are *snehana*, *asti poshana* and *Drudathwam* (stability).²⁴ During *Garbothpatti*, *sira* and *snayu* are formed from *snehamsha* of *medo dhathu*.²⁵
- *Medo dhathu* indicates fats in general and adipose tissues in particular.²³ Adipose tissue-derived mesenchymal stromal (MSCs) cells have a potential role in cartilage restoration.²⁶

***Sandhana karma* at the level of *Medo dhathu* includes Inhibition of Cartilage Matrix Degradation and Chondroprotective Activity.**

1. PALASHA: *Butea monosperma* Lam. - Fabaceae



- Indian medicinal plant, *Butea monosperma* flower extract and its bioactive constituent butein activates autophagy in human OA chondrocytes under pathological conditions, Butein -rich extract from the flowers of *Butea monosperma* suppress Matrix metallo-proteases and ADAMTSs which are responsible for cartilage extracellular matrix degradation.²⁷
- Natural Compounds: Potential Therapeutics for the Inhibition of Cartilage Matrix Degradation in Osteoarthritis.²⁸ As shown effective results.

5. ASTHI DHATU

- *Sandhana* refers to the Union of Fractured Bones and Maintenance of Bone Mineral density.

***Sandhana karma* at the level of *Asthi* refers to Fracture healing activity and Anti- Osteoporotic activity**

1. Asthisrunkala: *Cissus quadrangularis* linn. - Vitaceae



- Effect of *Cissus quadrangularis* in accelerating healing process of experimentally fractured radius-ulna of dog, a preliminary study: as shown the presence of high amount of anabolic steroidal substances, calcium, and phosphorus which helps in quicker mineralization of the callus.²⁹
- Clinical evaluation of *Cissus quadrangularis* as osteogenic agent in maxillofacial fracture, A pilot study: it was found that *C. quadrangularis* causes considerable reduction in the healing time of fractures, radiologically suggested an early callus formation as well as clinical pain, tenderness, and swelling were significantly absent.³⁰

2. Ambhastaki: *Cissampelos pareira* linn. - Menispermaceae



- Root extract contains terpenoids, alkaloids effective on bone formation through activation of the p38 MAPK pathway and autophagy in osteoblasts.³¹
- *Ambashtadi Gana Kashaya Pana* in *Bhagna Sandhana* - A Case Study; there was remarkable improvement in reduction of symptoms like swelling, Loss of function, pain and tenderness, thus beneficial in management of fracture.³²

6. MAJJA DHATU

- Its important function is *Snehanam karoti, Bala-krita, Asthnam puranam karoti.*
- *Majja Dhatu kshaya* leads to *Asti Saushirya, Ashti Daurbalya, Asthi Laghuta, Asthi Nistoda.*³³

- Bone marrow fluid possesses osteogenic and osteoinductive properties that can promote bone union alone.³⁴, Thus, bone marrow injection is given for delayed union or non-union of long bone fractures.³⁵

Sandhana karma at the level of Majja Dhathu can be understood as osteogenic promoting activity.

1. GUDUCHI: *Tinospora cordifolia* wild. - Menispermaceae



- Effect of alcoholic extract of Ayurvedic herb *Tinospora cordifolia* on the proliferation and myeloid differentiation of bone marrow precursor cells in a tumor-bearing host: *T. cordifolia* influence the myeloid differentiation of bone marrow progenitor cells and the recruitment of macrophages in response to tumor growth in situ.³⁶
- Pharmacological study of *Tinospora cordifolia* as an Immunomodulator: *T. cordifolia* extract stimulates the proliferation of stem cells. It increases the total number of WBCs and alpha-esterase-positive cells an indicator of increase in bone marrow cells.³⁷
- Ethnomedicine based evaluation of osteoprotective properties of *Tinospora cordifolia* on in vitro and in vivo model systems.³⁸: proved effective

7. SHUKRA DHATU

- *Sandhana* means *Shukra Sonitha Sandhana/Samyoga*. The process of Union or fusion of Sperm with Ovum to form Embryo.
- *Sandhaneeya dravya* enhances and maintains the Sperm plasma membrane and Acrosomal integrity, which is necessary for motility and fertilisation.

Sandhana karma at the level of *Shukra Dhathu* can be considered as,

- ✓ Sperm binding activity.
- ✓ Enhancement of sperm motility
- ✓ Fertilisation promotion

1. MADHUKA: *Glycyrrhiza glabra* linn. - Fabaceae



- Possible ameliorating effects of *Glycyrrhiza Glabra* (Licorice) on the sperm parameters in rats under high fat diet, *Glycyrrhiza Glabra* extract exert its ameliorating effects on the sperm parameters - sperm motility, sperm viability, Quality, sperm plasma membrane and Acrosomal integrity through its anti-obesity impact.³⁹

2. GUDUCHI: *Tinospora cordifolia* wild. - Menispermaceae



- Effects of *Tinospora cordifolia* supplementation on semen quality and hormonal profile in rams: Leaves contain large amounts of protein (11.20%), vitamin C, phosphorus, insulin/insulin like growth factors which maintain plasma and mitochondrial membrane and Acrosomal integrity.⁴⁰

List of sandhaneeya dravya along with their rasapancha as per classical texts:

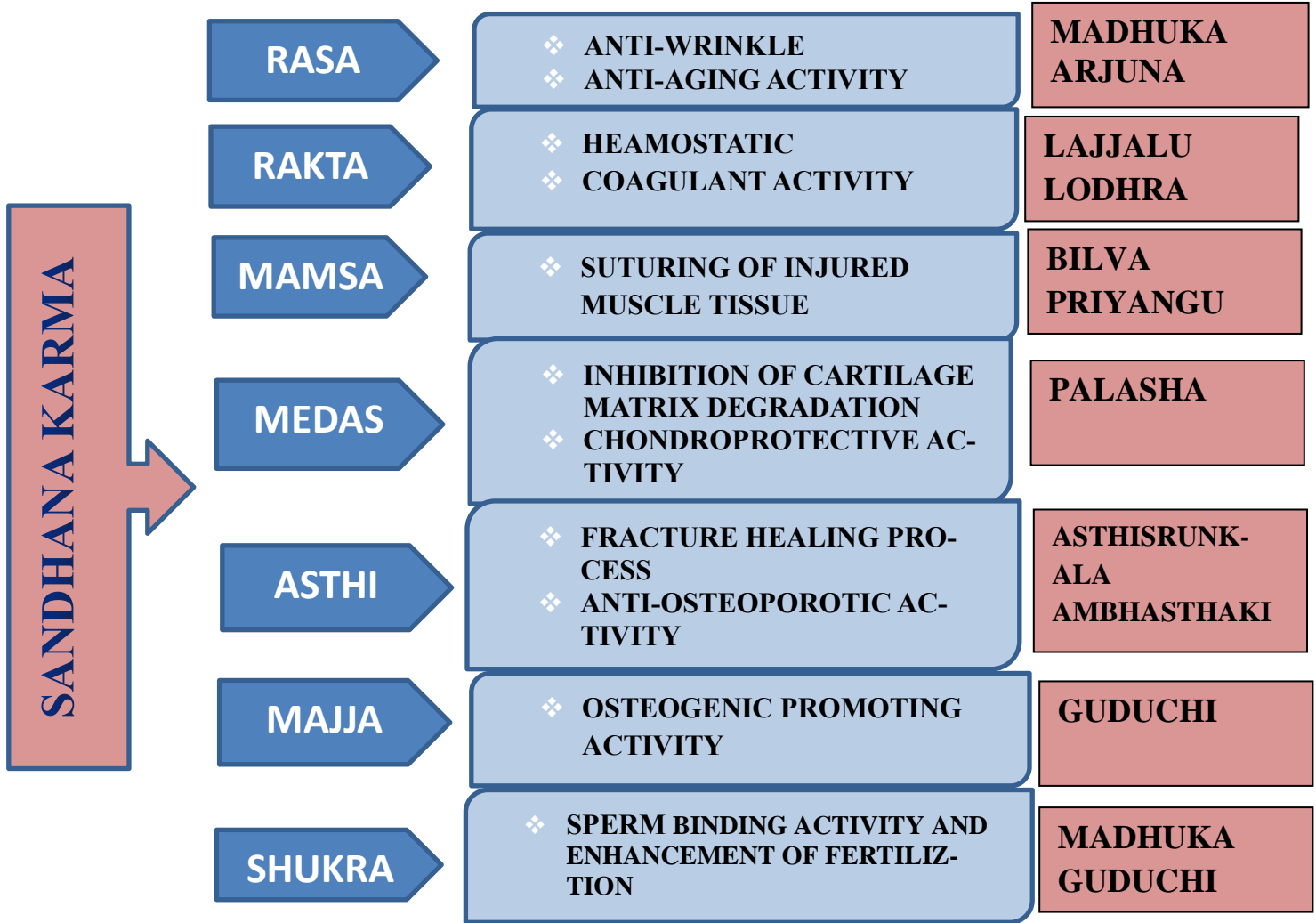
Name of the Drug	Botanical Name and family	Rasa	Guna	Veerya	Vipaka	Karma
Madhuka	<i>Glycyrrhiza glabra</i> linn. Fabaceae	Madhura	Guru, Snigdha	Sheeta	Madhura	Sandhaneeya, Varnya Vranaropana, Snehopaga
Madhuparni	<i>Tinospora cordifolia</i> wild. Menispermaceae	Tikta Katu	Laghu, Ushna	Ushna	Madhura	Sandhaneeya, Balya, Rasayana
Prishniparni	<i>Uraria picta</i> (Jacq.) Desi Fabaceae	Madhura	Laghu, Sara	Ushna	Madhura	Sandhaneeya Rasayana, Balya Vranavishodana
Am-bashthaki	<i>Cissempeilus pareira</i> linn. Menispermaceae	Katu	Laghu, Tikshna	Ushna	Katu	Bhagna sandhanakru th, Raktapittahara
Mocharasa	<i>Bombax ceiba</i> linn. Bombaceae	Kashaya	Laghu, Snigdha picchila	Sheeta	Madhura	Sandhaneeya, Brum- haneeya, Raktapittagna
Dhathaki	<i>Woodfolia fruiticosa</i> linn. Lythraceae	Kashaya, Katu	Laghu, Ruksha	Sheeta	Katu	Raktha stambhana, Vrana Ropana Sandhaneeya
Manjishta	<i>Rubia cordifolia</i> Rubiaceae	Madura, Tikta, Kashaya	Guru, Ruksha	Ushna	Katu	Sandhaneeya, Vrana ropana
Lodhra	<i>Symplocos racemosa</i> roxb. Symplocaceae	Kashaya	Laghu, Sheetha	Sheeta	Katu	Sandhaneeya, Vrana ropaka, Rakthastambhana

Priyangu	Callicarpa macrophylla vahl. Verbinaceae	Tikta, Kashaya,	Guru, Ruksha	Sheeta	Katu	Sandhaneeya, Vrana ropaka, Rakthasthambhana
Katphala	Myrica esculenta buch. -ham Myricaceae	Katu, Tikta, Kashaya	Tikshna Laghu	Ushna	Katu	Sandhaneeya, Vrana ropaka, Rakthasthambhana
Arjuna	Terminalia arjuna linn. Combretaceae	Kashaya	Laghu, Ruksha	Sheeta	katu	Sandhaneeya, Vrana ropaka- ksthambhaka
Palasha	Butea monosperma lam. Fabaceae	Katu, Tikta, Kashaya	Laghu, Snigdha	Sheeta	katu	Sandhaneeya, shothahara, sthambhaka
Bilva	Aegle marmelos linn Rutaceae	Tikta, Kashaya	Ruksha, Laghu	ushna	katu	Sandhaneeya, Vrana ropaka, Rakthasthambhana
Lajjalu	Mimosa pudica linn. Mimosaceae	Kashaya	Laghu, Snigdha	Sheeta	Madhura	Sandhaneeya, Ve- danasthapaka, Grahi, Shothahara

DISCUSSION & CONCLUSION

Dravyas attributed with *Sandhana karma* predominate *Kashaya-Tikta-MadhuraRas*, *Guru-Snigdha-picchila Guna*, *Sheeta veerya* and *Madhura/Katu Vipaka*.

Sandhana karma cannot be limited only to *Bhagna sandhana*. It needs to be understood at the level of *Sapta Dhathus*. Critical analysis of *Sandhana karma* renders the knowledge of specific *karmas* under different *dhatu*s and their correlated pharmacological activities. This assists in the selection of proper *Sandhaneeya dravya* in specific diseased conditions.



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