ĀRYAVAIDYAN

A QUARTERLY JOURNAL ON AYURVEDA AND ALLIED SCIENCES

ISSN 0970 - 4086 Vol. XXXIII, No. 3 February - April 2020

लाभानां श्रेय आरोग्यम्

Of all the gifts,
the most precious is health

Vaidyaratnam P.S. Varier's
Arya Vaidya Sala, Kottakkal, Kerala

Aryavaidyan, the quarterly journal of Arya Vaidya Sala, Kottakkal, is intended to encourage scientific writing and intellectual interactions among scholars, academicians, practitioners and students of ayurveda and allied subjects.

ĀRYAVAIDYAN

A QUARTERLY JOURNAL ON AYURVEDA AND ALLIED SCIENCES

VAIDYARATNAM P.S.VARIER'S
ARYA VAIDYA SALA, KOTTAKKAL

ĀRYAVAIDYAN

A QUARTERLY JOURNAL ON AYURVEDA AND ALLIED SCIENCES

ISSN 0970 - 4086; Vol. XXXIII, No. 3; February - April 2020

सततध्ययनं वादः परतन्त्रावलोकनम् ।
तद्विद्याचार्यसेवा च बुद्धिमेधाकरो गणः ।।

Constant study, mutual discussion,
learning other disciplines and
serving the preceptor - these factors
endow one with intelligence and memory

Details:

In India (inclusive of mailing): single copy, one hundred and twenty rupees; annual subscription (four issues) four hundred rupees. Out of India (postal charges extra) single copy, US dollars fifteen; annual subscription (four issues) US dollars fifty. Concessional rate for bonafide students of all systems of medicine in India, single copy, rupees ninety; annual subscription (four issues) rupees three hundred and twenty.

Please address all enquiries and subscriptions to: The Chief Editor (Publications), Arya Vaidya Sala, Kottakkal, Malappuram District, Kerala State, Pin - 676 503, India. Phone : 0483 -2742225, 2746665, Fax : 2742210, 2742572, E-mail: publications@aryavaidyasala.com.

Published by Department of Publications, Kottakkal Arya Vaidya Sala, Malappuram Dist. Kerala - 676 503, Phone: 0483 - 2742225, 2746665, Fax: 0483 - 2742210, 2742572, E-mail: publications@aryavaidyasala.com, Web: www.aryavaidyasala.com

CONTENTS

PLANT STUDY

Āryavaidyan, Vol. XXXIII, No. 3, February - April 2020, Pages 05 - 13

Preliminary pharmacognostic and phytochemical analysis of Lakṣmaṇā (*Ipomoea sepiaria* Koenig ex Roxb.)

Shree N., Remadevi R. and Raghunathan A.

ABSTRACT: Lakṣmaṇā (*Ipomoea sepiaria* Koenig ex Roxb.) is one of the member of the group 'Daśapuṣpa'. The purpose of this work is to give a scientific recognition to lakṣmaṇā. This study is an analytical one in which the preliminary pharmacognostic and phytochemical analysis of lakṣmaṇā was performed. Along with this review of classical and scientific literatures about lakṣmaṇā is also described. Pharmacognostic study has been performed from T.S. of root, stem and leaf. Preliminary phytochemical analysis has been performed by determining physicochemical parameters (total ash, water insoluble ash, acid insoluble ash, moisture content, volatile oil content, total sugar content and reducing sugar content, fibre content, etc.), qualitative analysis (detection of tannins, phenols, flavanoids, alkaloids and steroids) and TLC (Thin layer chromatography). This study will be helpful for further investigation of its standardization, pharmacological activity, toxicity and clinical trials.

Key words: Lakṣmaṇā, Pharmacognostic, Phytochemical

Introduction

In nāṭṭuvaidyam (folk medicine) it is mentioned that the goddess of lakṣmaṇā is 'Śrī Bhagavati/ Lakṣmī' and iṣṭasiddhi (spiritual attainment) is 'aiśvaryābhivardhanam'.[1] It is an important ingredient of many formulations mentioned in Sahasrayogam (lakṣmaṇāsiddha kṣīram, Sārasvata ghṛtam, Pullānyādi tailam, Caturakkaḷḷyādi tailam, etc.)[2] and other texts. In Rājanighaṇṭu it is placed in 7th varga (Mūlakādivarga).[3] In Madanapālanighaṇṭu it is described in 1st varga (Abhayādivarga).[4] It is also described in Soḍhalanighaṇṭu, Kaiyadevanighaṇṭu and Bhāvaprakāśanighaṇṭu in 7th varga (Lakṣmaṇādi varga)[5], 1st varga (Oṣadhivarga)[6] and 3rd varga (Guḍūcyādivarga)[7] respectively.

Botanical Name: *Ipomoea sepiaria* Koenig ex Roxb.[1]

Family: Convolvulaceae[8]

Vernacular names

Malayalam: Tirutāḷi, Cuṭṭitirutāḷi[8]

Tamil: Tāḷikkoṭi, Tāḷikkīrai, Mangikai[8]

Hindi: Baṅkālmī[8]

Bengal: Baṅkālmī[9]

Gujrati: Hanumān vel[9]

Marathi: Amtivel[9]

Telgu: Meetatuti, Purititige[9]

Oriya: Bilono, Mushakani[9]

Synonyms: The synonyms of lakṣmaṇā mentioned in Kaiyadevanighaṇṭu, Soḍhalanighaṇṭu, Rājanighaṇṭu, Madanapālanighaṇṭu and others are given in Table 1.

Explanation of synonyms

1. Lakṣmaṇā: Means possessed of lucky signs or marks.[8]

2. Putradā: Child giver.[8]

3. Raktabinducchadā/ Asrabinducchadā: Indicates the presence of blood like (reddish) marks on leaves.[8]

4. Sulañcchani, Bindupatra: Indicates marks on leaves.

5. Kaḷaṅkaparṇī: Having dirty marks on leaves.[8]

6. Sukandā: Means presence of rhizome.

Identification mentioned in classics

1. It has the shape like a putrakā (baby, pestle etc.),

Table 1
Synonyms of *Ipomoea sepiaria* mentioned in different texts

Synonyms	Kai.ni.[6]	So.ni.[5]	Rā.ni.[3]	Ma.ni.[4]	Shd.ni.[10]	Sar.ni. [11]	Abhi.bu.da.[12]	Abhi.ma.[7]
Putradā	+		+	+			+	
Putrajananī	+				+	+	+	
Putradātrī		+						
Putrakandā			+				+	
Raktabinducchadā	+				+	+		
Asrabinducchadā			+				+	
Bindupatrā				+				
Kaḷaṅkparṇī								+
Śūlāñccanī		+						
Madhuparṇī								
Laghuparṇī								+
Nāginī	+		+	+		+	+	
Nāga	+							
Nāgapatrī	+		+				+	
Nāgāhvā			+				+	
Nāgavatī						+		
Mañjikā			+					
Majjikā						+		
Mākṣikā							+	
Samañjakā	+							
Śvetapuṣpī		+						
Saubhāgya		+						
Āyupradā		+						
Gotravivardhanī		+						
Śūlinī	+							
Tūlini			+			+	+	
Raktā				+				
Sukandā			+				+	
Kḷitanī								+
Ravipriyā								+
Sthalajā								+
Jalajā								
Madhulikā								
Lakshmī		+						+
Lakṣmaṇā		+	+	+	+	+	+	+

+ = Present

red leaves, having small dots, emits smell like that of goat.[7]

2. Its flowers are like cow's milk i.e. white in colour. It is a hairy climber and its leaf possesses blood like reddish mark on leaves.[4]

Need and significance: Herbal drugs play an important role in health care programs especially in developing countries. There has been a steady increase in demand for green medicines and now these traditional systems have regained respectability among the scientific community. Ancient Indian literature incorporates a remarkably broad definition of medicinal plants and considered all plant and plant parts to be potential sources of medicinal substances. However, a key obstacle, which has hindered the acceptance of āyurveda medicine in the developed countries, is the lack of documentation and stringent quality control. There is a need for standardization of herbal drugs because without standards in plant sources of drugs, we cannot evolve standards in āyurveda formulations. With this backdrop, it becomes extremely important to make an effort towards standardization of the plant material to be

used as medicine. From over 3,00,000 species of higher plants to occur in nature, only about 2 % have been screened so far.[14] The purpose of this work was to enrich the documentation of less explored drug *Ipomoea sepiaria* coming under the group daśapuṣpa.

Aim and objective

In the present study, an attempt has been done to lay down preliminary pharmacognostic and phytochemical parameters of *Ipomoea sepiaria*.

Materials and methods

Collection of samples: Fresh sample of *I. sepiaria* was collected from Indianoor, Malappuram, Kerala. Plant specimen was identified and authenticated by Department of Dravyagunavijnana, V.P.S.V. Ayurveda College, Kottakkal. The plant material was washed thoroughly with tap water, shade dried for 4-5 weeks and homogenized to powder by mechanical grinder and the powder was stored in tight container for further analysis.

Study design: Analytical study

Settings:

a. Pharmacognostical and Phytochemical Lab., V.P.S.V. Ayurveda College, Kottakkal.

b. Toxicology Lab., Department of Agadatantra, V.P.S.V. Ayurveda College, Kottakkal.

Plan of the study: Present study comprised of two main components namely literary review and analytical study.

Literary review

A detailed review of all the available literatures on *I.sepiaria* has been performed.

Analytical study

a. Pharmacognostic analysis: A preliminary pharmacognostic analysis was performed for root, stem and leaf of *I.sepiaria*.

b. Phytochemical analysis: A preliminary phytochemical analysis of *I. sepiaria* was performed using the following parameters.

1. Determination of physicochemical parameters: Determination of total ash, water insoluble ash, acid insoluble ash, moisture content, volatile oil content, sugar content (total sugar and reducing sugar), successive solvent extraction using appropriate solvents, fibre content, water soluble extract, cold alcohol soluble extract and hot alcohol soluble extract by using standard methods.

2. Qualitative analysis of the extracts: Detection of tannins, phenol, flavonoids, alkaloids and steroids by using standard methods.

3. Thin layer chromatography: TLC of successive solvent extract was performed by using suitable solvent system.

Plant description

Varieties: There are two varieties of Ipomoea: *Ipomoea sepiaria* and *Ipomoea obscura*. Though either in *I. sepieria* or *I. obsura* all the above marks were not clearly seen; in the leaves of *I. sepiaria* reddish brown patches occur on leaves, and flowers of *I. obscura* were yellowish or white.[8]

Distribution and habitat: This plant occurs throughout India in the plains, especially near the coast and up to an elevation of about 500 feet in hills. It grows commonly over hedges and thickets often near water margin, on banks of streams and rivers.[8]

Habit and general features: *Ipomoea sepiaria* is a glabrous or occasionally pubescent or hirsute, slender twiner with a slightly thickened or tuberous perennial root and very short stem producing annually or seasonally a number of terete villous, grayish purple branches bearing simple, cordate or ovate- cordate, variable medium sized leaves, very often blotches with dull purplish patches in the centre and pink to purplish flowers in cymose clusters on fairly long thickened clavate peduncles.[8]

Macroscopic Description: See Figure 1.

Figure 1
Macroscopic description of *Ipomoea sepiaria*

Root: The root system consisted of a fairly long, somewhat thickened tap root and several slightly thinner or slender branches, arising from its base with very few wiry rootlets. The main roots were light brown to stale grey with smooth non- lenticellate surface. The surface skin is soft, very thin and easily scrapable. The living tissue within, was whitish when fresh, but exposure to air quickly turns it grey. It has a starchy sweetish taste with slight acridity. The centre of the root is occupied by a strong cord of woody tissue.[8]

Leaves: Alternate, petioled, one to three inches long and three quarters to two inches broad, usually glabrous or rarely somewhat pubescent, ovate-cordate, with a wide sinus and rounded basal lobes, to hastate with acute lobes, entire, sinuate or rarely lobed acute at apex and most often bloyched with brownish or purplish broun patches towards the centre. The hastate leaves were usually narrower, being only half to one inch broad and indented at sides. Petiole is 1- 2 inches long.[8]

Inflorescence: A cymose subumbellate cluster of two or twelve or more flowers on a long thickened clavate smooth round axillary peduncles as long as or more often longer than the leaf, in which case it may vary from 4- 9 inches.[8,14]

Flowers: Pedicelled, showy, light pink to purplish, with purplish tube.[8]

Pedicels: Short 0.1 to 0.5 inch long, but become thicker and clavate in fruit.[8]

Bracts: Small, lanceolate and caduceus.[8]

Sepals: 5 ovate or broadly elliptic, obtuse, sub obtuse or shortly apiculate, glabrous with membranous margin; the outer two slightly shorter scarcely 0.25 inch long and rugose outside.[8]

Corolla: One and a half to two inch long, light pink purple or rarely white with a dark eye; tube about one inch long, cylindric or tubular, funnel shaped, dark purple within, mouth abruptly widened; limb five lobed or five plaited with shortly lobed margins.[8]

Stamens: Five, unequal, filaments filiform, included the hairy anthers at base, oblong.[8]

Disc: Annular.[8]

Ovary: Two celled and four ovuled with filiform style ending in two globose stigmatic lobes.[8]

Fruit: An ovoid capsule one fourth to one third inch in diameter, seeds four, 0.15 inch long, grey minutely tawny and velvety.[8]

Officinal part: Root[8]

Microscopic description

Root: A transverse section of root of *Ipomoea sepiaria* revealed the following important structures. Figure 2.

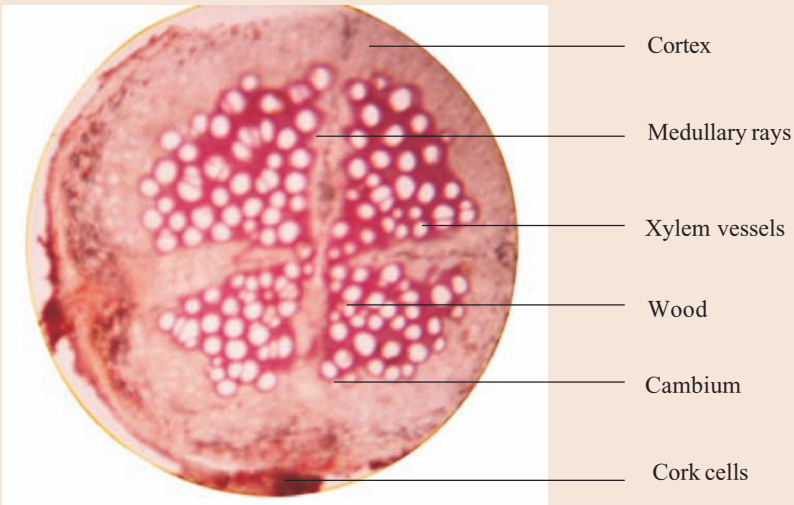
1. Root: Nearly circular in cross section with regular outline.

2. Phellem: Very narrow and consisted of two to four rows of cork cells with light brown walls.

3. Cortex: Comparatively wide and formed of many rows of thin walled cells with irregular spaces. Majority of the cells were densely packed with starch grains.

4. Wood: Most cases showed three or four broad prominent medullary rays starting from the centre

Figure 2
T. S. of *Ipomoea. sepiaria* root



and alternating with broad wedges of xylem containing several uniseriate rays.

5. Xylem: Mostly composed of large sized vessels and fibres, parenchyma being proportionately less.

6. The cells of the medullary rays were thin walled and packed with starch. Pith was absent in the centre.

Stem: A transverse section (T.S.) of stem revealed the following important structures. Figure 3.

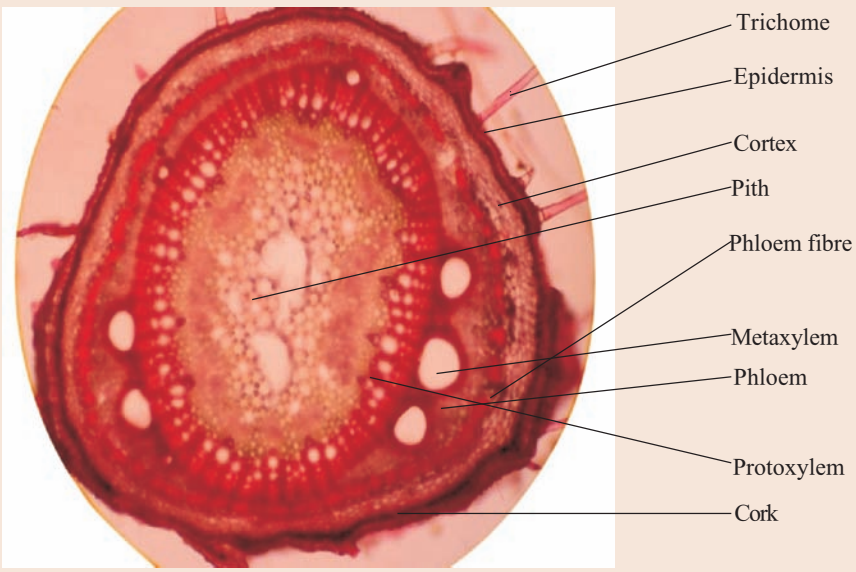
1. The outermost single layered epidermis was present which composed of compactly arranged tubular parenchymatous cells. A large number of multi-cellular epidermal hairs (trichomes) were also present.

2. Few layered cork cells were present towards the periphery.

3. Below epidermis few layered cortex was present, which consisted of loose parenchymatous cells. The cells were thin walled, rounded or oval.

4. Vascular bundles are arranged in a ring. Each bundle has a patch of xylem towards centre and phloem towards periphery. In xylem, vessels were

Figure 3
T. S. of *Ipomoea. sepiaria* stem

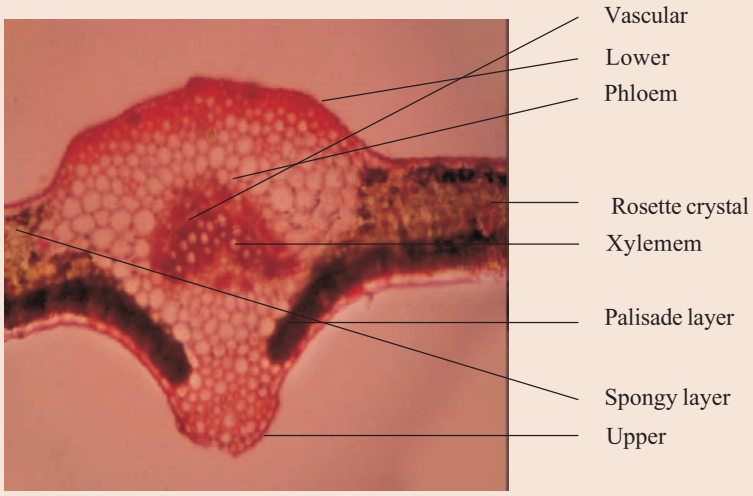


arranged in radial rows with protoxylem lying towards centre and metaxylem towards cambium, i.e. endarch arrangement of xylem.

5. A central pith was present which consisted of parenchymatous cells. These cells were rounded or polygonal, thin walled with several intercellular spaces. The cells of pith stores food material.

Leaf: Showed following important structures. Figure 4.

Figure 4
T. S. of *Ipomoea. sepiaria* leaf



1. Epidermis: There are two epidermal layers, one on adaxial (dorsal) and other on abaxial (ventral) surfaces and are accordingly called upper epidermis and lower epidermis, respectively. Epidermis is uniseriate, composed of a row of compactly arranged, thin walled parenchymatous cells.

2. Mesophyll tissues: Here the ground tissue forming the mesophyll was differentiated into palisade and spongy layers. Palisade cells were found below the upper epidermis. They were columnar in shape with scanty intercellular spaces. The palisade cells were arranged in rows. The spongy cells were present below the lower epidermis and were polygonal in shape. These were quite loosely arranged with large number of intercellular spaces. Rosette crystals were present in spongy layers of mesophyll tissues.

3. Vascular bundle was embedded in mesophyll tissues. Xylem lies towards upper epidermis and phloem towards lower epidermis.

Observations of the study: Refer Table 2 to 6.

Table 2
Physicichemical analysis of *Ipomoea sepiaria*

Sl.No.	Experiments	Percentage(W/W)
01.	Moisture content	18%
02.	Volatile oil content	1%
03.	Total ash	4.17%
04.	Water insoluble ash	3.545%
05.	Acid insoluble ash	0.035%
06.	Fibre content	56%
07.	Sugar content	
	A. Total sugar	14.6%
	B. Reducing sugar	9.8%

Methodology of TLC: For TLC (Thin layer chromatography) study all (successive) extracts were spotted in one solvent system [chloroform: ethyl acetate (7 : 3)]. The plate was allowed to develop and the spots were visualized in ordinary light after spraying ethanolic sulphuric acid (Figure 5). The result is given in Table 7.

Petroleum ether extract gave two spots viewed in visible light. Both spots were brown coloured. Cyclohexane extract gave three spots of light brown

Table 3
Percentage of water soluble extractives of *Ipomoea sepiaria*

Sl.No.	Name of extract	Colour of extract	% of extract
01.	Hot water extracts	Dark brown	24.81 %

Table 4
Percentage of alcohol soluble extractives of *Ipomoea sepiaria*

Sl. No.	Name of extract	Colour of extract	% of extract
01.	Cold alcohol extracts	Brown	7.208 %
02.	Hot alcohol extracts	Greenish brown	14.23%

Table 5
Successive solvent extraction of *Ipomoea sepiaria*

Sl.No.	Experiments	Colour of extract	Percentage(W/W)
01.	Petroleum ether	Light brown	2.736%
02.	Cyclohexane	Light green	1.578%
03.	Acetone	Dark green	6.982 %
04.	Alcohol	Dark brown	4.972%

Table 7
TLC analysis of successive solvent extracts of *Ipomoea sepiaria*

Solvent system	Extract	Spot detection	No. of spots	Rf values
Chloroform: ethyl acetate (7 : 3)	P.E.	Visible	2	0.21, 0.89
	C.H.	Visible	3	0.28, 0.41, 0.98
	Acetone	Visible	9	0.14, 0.22, 0.27, 0.30, 0.35, 0.39, 0.43, 0.47, 0.96
	Alcohol	Visible	7	0.14, 0.22, 0.26, 0.32, 0.40, 0.41, 0.98

Figure 5
TLC of *Ipomoea sepiaria* visualised in ordinary light

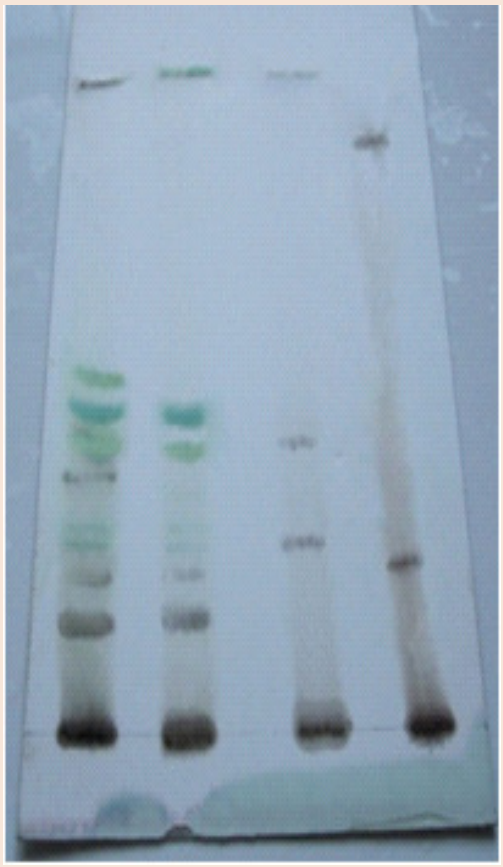


Table 6
Qualitative chemical examination of *Ipomoea sepiaria*

Extract	Chemical constituents					
	Tannin	Phenol	Flavonoids	Alkaloids		Steroids
				Dragendroff's test	Mayer's test	
Petroleum ether	+	_	+	+	+	+
Cyclohexane	+	_	+	_	_	+
Acetone	+	+	+	_	_	+
Alcohol	+	+	+	+	+	+
Cold alcohol	+	+	+	_	_	+
Hot alcohol	+	+	+	_	_	+
Water	+	+	+	_	_	+

+ = Present; - = Absent

colour. In acetone extract, nine spots were formed. Among those spots first and second was light grey; third, fourth, sixth and eighth were light green; fifth and ninth spot was dark grey; and seventh was of dark geern colour. In alcohol extract seven spots were formed. Among those spots first and second was light gery; third, forth and fifth were light green; sixth was green and seventh was dark green.

Properties and action according to ayurvedic texts

Rasa: Madhura, Lavaṇa[6]; Alavaṇa, Madhura[13]

Guṇa: Guru, Rūkṣa, Sara[6,7]

Vīrya: Śīta[6]

Indigenous therapeutic uses

Codified uses:

1. Doṣaghnatā: Vāta-pittahara and kaphavardhaka.[6]

Tridoṣaśāmakapittahara and vāta-śleṣmala.[8]

2. It is vṛṣya, promoting bodily strength and garbhakāraka.[6]

3. It cures sterility in women, rasāyana and balya.[3]

4. As said by great sages it is surely bestower of children.[7]

5. The rhizome of lakṣmaṇā is vraṇa-vātahara.[7]

Empirical uses:

1. The juice is used as a deobstruent and diuretic.[13]

2. It is considered as a good antidote to arsenic.[13]

Discussion and conclusion

It is one of the important member of daśapuṣpa (a group of combination of ten plants). Its references are available in many āyurveda texts. There are sufficient number of preparations mentioned in which the plant is being used along with other members of daśapuṣpa or with other drugs (eg. Lakṣmaṇādi-siddhakṣīram, Pullānyādi tailam, Sārasvata ghṛtam, Noṅṅaṇādi ghṛtam, Pāṇalpātiryādi ghṛtam, Mānasamitravaṭakam, etc.). Only few researches are conducted on this drug for its analytical profile. Considering these facts, this study has been conducted and completed.

In literary review, all available details about the drug have been described. It includes synonyms, botanical description, āyurveda properties, empirical uses, etc. In Rājanighaṇṭu it is placed in 7th Varga (Mūlakādi varga), in Madanapālanighaṇṭu it is described in the 1st varga (Abhayādi varga), in Soḍhalanighaṇṭu it is described in the 7th varga (Lakṣmaṇādi varga), in Kaiyadevanighaṇṭu it is described in 1st varga (Oṣadhi varga) and in Bhāvaprakāśa nighaṇṭu it is described in 3rd varga (Guḍūcyādi varga).

In Rājanighaṇṭu, vārāhi is also included in 7th Mūlakādi varga. In Madanapālanighaṇṭu four members of daśapuṣpa (viṣṇukrāntī, vārāhi, durvā and bhṛṅgarājaḥ) are also described in 1st Abhayādi varga and in Soḍhalanighaṇṭu vārāhi and sahadevi are also described in 7th Lakṣmaṇādi varga. In Kaiyadevanighaṇṭu five other members of daśapuṣpa (viṣṇukrānti, vārāhi, dūrvā, bhṛṅgarājaḥ and viparīta lajjālu) are described in 1st Oṣadhi varga. Bhāvamiśra has mentioned vārāhi, dūrvā, bhṛṅgarājaḥ and viparītalajjālu in 3rd Guḍūcyādi varga along with lakṣmaā.

T.S. of root of *I. sepieria* showed that majority of cortex cells are densely packed with starch cells. The cells of the medullary rays were thin walled and packed with starch. There was no pith in the centre. T.S. of stem showed few layered cork cells present towards periphery. A large number of multicellular epidermal hairs (trichomes) were also present. Cambium is present in between xylem and phloem in vascular bundle. In T.S. of leaf rosette crystals were present in spongy layers of mesophyll tissues.

The result of qualitative analysis showed positive result for many of the chemical constituents like tannins, phenolic extracts, flavanoids, steroids and alkaloids. Tannins, flavanoids and steroids were present in all the extracts of *I.sepiaria.* Phenolic extracts were present in all the extracts except petroleum ether and cyclohexane soluble extracts In *I. sepieria*, alkaloids were present in P.E. and alcohol soluble extract by successive extraction by both DDR test and MR test.

In TLC analysis of successive solvent extracts of *I.sepiaria*, petroleum ether, cyclohexane, acetone and absolute alcohol extracts gave 2, 3, 9 and 7 spots respectively. Both spots obtained by petroleum ether extracts were brown coloured. Cyclohexane extracts gave three spots of light brown colour. Among nine spots of acetone extracts 1st, 2nd, 5th and 9th spots were of grey colour and remaining five spots were green.

The microscopic study will be helpful in correct botanical identification of *I. sepiaria*. The qualitative screening revealed the presence of tannins, phenols, flavanoids, alkaloids and steroids in different solvent

extracts which could have a great potential towards improving health of human being. The TLC profile will be helpful for the further identification of individual chemical constituents. This information hopefully will trigger a new interest among modern scientists to investigate further in this area.

Reference

1. Hafeel A., *Nattuvaidyam*, P 125-128, 2nd Edition, DC Books, Kottayam, Kerala, 2004.

2. *Sahasrayogam*, Hindi translation by Ramnivas Sharma and Surendra Sharma, P 63, 253, 296 and 316, Reprint edition, Chaukambha Sanskrit Pratishthan, Delhi, 2007.

3. Narahari, *Rajanighantu,* Commented by Indradeva Tripathi, 4th Edition, 7th Varga, P 209-210, Chaukhambha Krishnadas Acadamy, Varanasi, 2003.

4. Madanapala, *Madanapalanighantu*, Edited and Commented by Hariprasad Tripathi, 1st varga (Abhayādi varga), P 68, 1st Edition, Chaukhambha Krishnadasa Acadamy, Varanasi, 2009.

5. Sodhala, *Sodhalanighantu*, Commented by Gyanendra Pandey, Edited by Dwivedi R. R., 7th Varga, P 17 and 126, Chaukhambha Krishnadas Acadamy, Varanasi, 2009.

6. Kaiyadeva, *Kaiyadevanighantu*, Edited and Commented by Sharma P. V., Chapter 1, P 642, Chaukhambha Orientalia, Varanasi, 2006.

7. Bhavamisra, *Bhavaprakasa*, Edited by Srikanthamoorthy K. R., Volume I, P 251, Chowkambha Krishnadas Academy, Varanasi, 2008.

8. Namboodiri A. N., Ayer N. K. and Kolammal M., *Pharmacognosy of Ayurvedic Drugs, Kerala*, Series I, No. 3, P 57-64, Pharmacognosy Unit, Govt. Ayurveda College, Thiruvananthapuram, 1957.

9. Kirtikar K. R. and Basu B. D., *Indian Medicinal Plants*, Volume III, P 1723-1724, 2nd Edition, M/S Bisen Singh Amritpal Singh, New Connaught Place, Dehradun, M/S Periodical experts, D-42, Vivek Vihar, Delhi-32, 1975.

10. Goli Penchala Prasad, *Sadrasanighantu*, Edited by Pammi Satyanarayana Sastry, Chapter 1, P 22, 1st Edition, Chaukambha Sanskrit Series, Varanasi, 2009.

11. Kamat S. D., *Saraswatinighantu*, Chapter 4, P 70, 1st Edition, Chaukambha Saskrit Pratishtan, Delhi, 2006.

12. *Indian Medicinal Plants*, Edited by Warrier P. K., Nambiar V. P. K. and Ramankutty C., Volume III, P 237, Orient Longman Pvt. Ltd., Chennai, 2003.

13.Bhavamisra, *Gunaratnamala*, Edited by Kailash Pati Pandey and Anugrah Narain Singh, 6th Varga, P 305, 1st Edition, Chowkambha Sanskrit Bhavan, Varanasi, 2006.

14. www.idosi.org

Authors

Shree N., Associate Professor, Major S. D. Singh P.G Ayurvedic Medical College and Hospital, Fatehgarh, Farrukhabad, Uttar Pradesh.

Remadevi R., Former Professor and Head, Department of Dravyagunavijnana, VPSV Ayurveda College, Kottakal, Kerala.

Raghunathan A., CMO, Govt. Ayurveda Hospital, Edakkara, Nilambur, Kerala.

EXPERIMENTAL STUDY

Āryavaidyan, Vol. XXXIII, No. 3, February - April 2020, Pages 14 -19

Study of the efficacy of Gomūtrabhāvita jalakumbhī bhasma in animal model of Hypothyroidism

Pooja Rani, Khemchand Sharma and Shuchi Mitra

ABSTRACT: Hypothyroidism is a clinical state of underactive thyroid that fails to produce enough thyroid hormone causing an overall decrease in physical and mental activity. This study was intended to investigate the effect of Gomūtrabhāvita jalakumbhī bhasma in animal model of hypothyroidism. Four groups of male albino rats were used. Group I served as vehicle control, Group II, III and IV were given Carbimazole (1.35mg/kg body weight) orally for 21 days. After this period, Group I and II received distilled water, Group III was treated with 2μg/kg Thyroxine sodium and Group IV was given 270mg/kg/BD Gomūtrabhāvita jalakumbhī bhasma for another successive 21 days. Body weight was noted weekly and dose was calculated according to weight change. Blood samples were collected from retro-orbital plexus of every rat of each group on 0, 21 and 42 day for the analysis to evaluate T3, T4 and TSH parameters by ELISA method. The significant decrease in the total T4 and T3 levels and increase TSH level suggested that the administrated dose and duration of induction was sufficient to induce hypothyroid status in experimental group of rats. Growth rate was restricted in Carbimazole treated groups. However, test group showed highly significant difference in all thyroid parameters when compared with control group after study. Growth rate was found not significant, after being treatment with test drug. Thus, it was concluded that Gomūtrabhāvita jalakumbhī bhasma at a dose of 270 mg/kg effectively normalise T4, T3 and TSH profile in experimental animals.

Key words: Gomūtrabhāvita jalakumbhī bhasma, Hypothyroidism, Carbimazole, Thyroxine sodium

Introduction

Thyroid gland is considered as one of the most important endocrine glands.[1] Thyroxine (T4) and Triiodothyronine (T3) are necessary for the growth, metabolism and functioning of virtually every cell in the body.[2] Hypothyroidism is a clinical state of underactive thyroid that does not produce enough thyroid hormone causing overall decrease in physical and mental activities. The thyroid hormone levels are maintained within normal limits by the hypothalamic-pituitary-thyroid axis; whereas in hypothyroidism, the synthesis of T4 and T3 hormones is decreased and due to feedback mechanism; TSH is produced in high quantities. For the synthesis of Thyroid hormones, iodine is an essential trace element; its deficiency contributes to the manifestation of hypothyroidism. In iodine sufficient regions, the most common cause of hypothyroidism[3] is autoimmunity. Although synthetic drugs are used as effective thyroid profile regulators, their long-term use is attended with some adverse effects as skin rash, hair loss, drowsiness, stomach upset etc.[4] in certain individuals. It is in this scenario that traditional systems of medicine were found worth trial for the management of this clinical condition.

The exact terminology for hypothyroidism is not available in āyurveda. However, based on signs and symptoms, gaḷagaṇḍa can be correlated with the hypothyroidism.[5] Numerous formulations are described in the texts of āyurveda for the management of gaḷagaṇḍa. Jalakumbhī (*Pistia stratiotes*) is an aquatic plant attributed for lot of therapeutic uses[6] since Samhitā period. Its gaḷagaṇḍahara property has been mentioned in many āyurveda texts. Ācārya Bhāvaprakāśa depicted the internal use of Jalakumbhī bhasma processed with gomūtra for the management of gaḷagaṇḍa.[7] However, apart from this traditional reference, no

scientific investigations have been so far undertaken. Therefore, the present investigation was carried out. This study is an attempt to explore the possible anti-hypothyroidal activity of Jalakumbhī bhasma processed (bhāvita) in gomūtra by testing it on Carbimazole induced hypothyroidism in albino rats considering T4, T3 and TSH as the main parameters.

Materials and methods

Test drug: Fresh jalakumbhī plants were procured from Ganga river, Shukra Taala, Muzaffarnagar, Uttar Pradesh and were subjected to authentication macroscopically in the Department of Dravyaguṇa, Rishikul Campus, Haridwar and microscopically by Bilwal Medchem and Research Laboratory Pvt. Ltd. Jaipur. Raw jalakumbhī plants were cleaned and dried before usage. Fresh gomūtra was procured from local diary farm. Jalakumbhī (1 Kg) was taken in a stainless-steel container and burnt till it completely turned into ash. The ash was left for cooling to room temperature. This powder (ash) was triturated with 300ml of gomūtra by manual means. Whenever the paste is dried due to trituration, 100 ml of gomūtra was further added to the Jalakumbhī bhasma. Similarly, gomūtra was added to Jalakumbhī bhasma for 6 times after the first bhāvana. Thus, a total of 7 bhāvana were given to Jalakumbhī bhasma. The obtained product was dried in shade and the Gomūtrabhāvita jalakumbhī bhasma was kept in an air-tight container due to its hygroscopic nature.

Chemicals: Carbimazole was used to induce hypothyroidism in male albino rats and Thyroxine sodium was used as anti-hypo thyroidal activity. Both the chemicals were procured from standard and reputed firms (The Unique Traders, Nagpur) and both were of analytical grade.

Test drug dose calculation: Dose fixation of test drug for rats was calculated on the base of body surface area ratio by referring to table of Paget and Barnes (1964)[8] as follows:

Human dose X Body surface area ratio (convertibility factor) for animals.

Adult human dose of test drug i.e. Gomūtrabhāvita jalakumbhī bhasma = 3gm BD/day[9]

Rat dose = 3 X 0.018 = 54 mg BD for 200 gm of rat.

Rat dose per kg = 54 X 5 = 270mg/kg body weight of rat (BD)

Drug schedule: Test drug and vehicle were administered between 9 am to 10 am and 4 pm to 5 pm daily.

Animals: Wistar albino rats (male) weighing between 200 ± 20 gms were used for the experiment. The experimental study was carried out at Animal House Pharmacological Laboratory, DMIMS (DU), Wardha, Maharashtra. The experimental protocols were approved by the Institutional Animal Ethics Committee (DMIMS(DU)/IAEC/2018-19/08) in accordance with the guideline formulated by CPCSE, India.

Grouping of animals

Adult male wistar albino rats weighing (200 ±20 gm) were used. 24 rats were divided in 4 groups with 6 rats in each group. Group I served as normal control throughout the study period and was given distilled water 5ml/kg. Group II, III and IV received Carbimazole at the dose of 1.35 mg/kg for 21 days. After that Group II, III and IV received 5 ml/kg of distilled water, thyroxine sodium (2mcg/kg) and Gomūtrabhāvita jalakumbhī bhasma (270mg/kg/BD), respectively for another successive 21 days. Control, test drug and standard drug were given orally with gavage needle (16 number).

Husbandry conditions: Rats were kept in research facility with controlled temperature (22 ±03^{0}C) throughout the experiment. The animals were exposed to 12 hours light and 12 hours dark cycle with the relative humidity of 50 to 70%.[10]

Diet: They were fed on a standard rat food made by 20% casein, 15% corn oil, 55% corn starch, 5% salt blend and 5% vitaminized starch. The drinking water was given ad libitum in polypropylene bottles with a stainless-steel sipper tube.

Hematological tests: Blood samples were collected from retro-orbital plexus of every rat of each group on before induction of disease, after induction of disease and after treatment. Serum was separated by centrifugation at 2000 rpm for 15 min in a normal centrifuge and used for the analysis to evaluate parameters like T3, T4 and TSH by ELISA method.[11,12]

Statistical analysis: Results are presented as Mean SEM, differences between the groups were statistically determined by Paired t- test and unpaired t-test and one-way ANOVA analysis using Sigmastat 4.0 software. The level of significance was noted and interpreted accordingly.

Results

Body weight of all the rats is shown in Table 1. After treatment, the body weight of rats of Standard drug (TX) group (267.583 ± 12.438 gm) and Test drug (JBG) group (262 ± 11.818 gm) was relatively higher than the Disease control (DC) group (235.833 ± 5.759 gm).

Table 1
Body weight of rats at three different time periods

Group	Before induction	After induction	After treatment
VC	192.333±6.275	257.167±6.140*	300.667±8.547*
DC	205.833±6.858	224.583±5.604	235.833±5.759
TX	188.5±6.854	225.583±14.048	267.583±12.438*
JBG	192.167±8.014	223.833±9.645	262±11.818

*p<0.05, **p<0.01 in comparison to disease control values expressed as mean ± SEM. Data analysed by one-way ANOVA followed Holm-Sidak method. VC: Vehicle control, DC: Disease control, TX: Thyroxine sodium, JBG: Gomūtrabhāvita jalakumbhī bhasma. SEM: Standard error of mean.

Thyroid profile of all the rats is shown in Table 2. The hormonal values of Vehicle control (VC) group rats were found to be T4 (5.667± 0.326 µg/dl),T3 (1.241± 0.150ng/ml)and TSH (1.158± 0.127µIU/ml) on 21st day of study. After induction of hypothyroidism in DC group, the hormonal values were found as T4 (2.417±0.279µg/dl), T3 (0.391±0.063ng/ml) and TSH (10.739±0.956 µIU/ml). After induction of hypothyroidism inTX group, T4 value reduced to 2.083±0.419 µg/dl and T3 values decreased to 0.221±0.081ng/ml. In TX group, TSH value increased to 9.427±0.571µIU/ml after induction of hypothyroidism. Similarly, in JBG group, T4 value decreased to 2.595±0.155 µg/dl and T3 values decreased to 0.466±0.028 ng/ml. TSH value was increased to 10.406±0.498 µIU/ml.

Table 2
Mean±SEM of T4, T3 and TSH parameters of rats of different groups at variable time period

Parameter	Group	Before induction	After induction	After treatment
T4	VC	5.55±0.34	5.667±0.326**	5.718±0.421**
	DC	6.21±0.55	2.417±0.279	2.771±0.271
	TX	6.15±0.61	2.083±0.419	5.856±0.391**
	JBG	5.79±0.33	2.595±0.155	4.763±0.331**
T3	VC	1.20±0.15	1.241±0.150**	1.283±0.096**
	DC	1.26±0.17	0.391±0.063	0.737±0.109
	TX	1.15±0.18	0.221±0.081	1.585±0.144**
	JBG	1.24±0.17	0.466±0.028	1.177±0.099*
TSH	VC	1.16±0.13	1.158±0.127**	1.180±0.133**
	DC	1.33±0.24	10.739±0.956	9.087±0.791
	TX	1.06±0.12	9.427±0.571	2.914±0.346**
	JBG	0.97±0.18	10.406±0.498	1.624±0.276**

*p<0.05, **p<0.01 in comparison to disease control. Values expressed as mean SEM. Data analysed by one-way ANOVA followed Holm-Sidak method. T4: Thyroxine hormone, T3: Triiodothyronine hormone, TSH: thyroid stimulating hormone, VC: Vehicle control, DC: Disease control, TX: Thyroxine sodium, JBG: Gomūtrabhāvita jalakumbhī bhasma. SEM: Standard error of mean.

Considering hormonal level after treatment (after 42 days of study),insignificant variations were observed in T4, T3 and TSH levels in VC.Furthermore, in TX group, T4 level(5.856±0.391µg/dl) and T3 level (1.585±0.144 ng/ml) were increasedwhereas,TSH value decreased to 2.914± 0.346µIU/ml in rats. The effect of thyroxine sodium on: T4 is 3.772 ± 0.553 µg/dl, T3 is 1.364 ± 0.172 ng/ml, and TSH is -6.513 ± 0.584 µIU/ml. Likewise, the rats treated with JBG group showed increase in T4 value (4.763± 0.331µg/dl), T3 value (1.177± 0.099ng/ml) and decrease in TSH level (1.624± 0.276 µIU/ml). The effect of Gomūtrabhāvita jalkumbhī bhasma on: T4 is 2.168 ± 0.358 µg/dl, T3 is 0.628 ± 0.117 ng/ml, and TSH is -8.782 ± 0.429 µIU/ml.

Statistical analysis of thyroid hormones parameters between standard control and test control is shown in Table 3. The analysis revealed that there was significant difference in T3 and TSH parameters after completion of treatment.

Table 3
Comparative statistical analysis of Thyroid hormones parameters between group TX and JBG after treatment

Parameters	Group	N	Missing	Mean	Std. Dev.	SEM	t value	p value
T4	TX	6	0	5.856	0.973	0.397		
	JBG	6	0	4.763	0.811	0.331	2.114	0.060
	Difference			1.093				
T3	TX	6	0	1.585	0.352	0.144		
	JBG	6	0	1.177	0.245	0.099	2.327	0.042*
	Difference			0.491				
TSH	TX	6	0	2.914	0.848	0.346		
	JBG	6	0	1.624	0.676	0.276	2.913	0.015*
	Difference			1.290				

*p<0.05. Data analysed by Unpaired t test between TX and JBG after Treatment. T4: Thyroxine hormone, T3: Triiodothyronine hormone, TSH: Thyroid stimulating hormone, TX: Thyroxine sodium, JBG: Gomūtrabhāvita Jalakumbhī bhasma. N: No. of rats, SEM: Standard error of mean.

Discussion

Thyroid dysfunction is a common endocrine disorder leading to hyperthyroidism and hypothyroidism. In hypothyroidism, decreased T4 and T3 and increased TSH status are the main hormonal disturbances implicated. Jalakumbhī bhasma with gomūtra has reported for gaḷaganḍa (hypothyroidism) in various classics. This study was designed to evaluate the effect of oral administration of Gomūtrabhāvita jalakumbhī bhasma on thyroid profile in hypothyroidism. The study was initiated after obtaining ethical clearance from IAEC (DMIMS(DU)/IAEC/2018-19/08). The husbandry conditions, diet, acclimatization period, numbering and identification of animals and dose fixation were done as per OECD guidelines.

Hypothyroidism was induced with Carbimazole (1.55 mg/kg body wt.) for 21 days of duration. Carbimazole acts as a false substrate for thyroid peroxidase, this blocks the iodination of thyroid residues within thyroglobulin and coupling of iodothyronines.[13] Oral dosage of Carbimazole through Gavage needle was a convenient method for providing unit dose per body weight of rats individually and a better method for establishing hypothyroidism in experimental animals. After induction of hypothyroidism, the treatment was given with Thyroxine sodium (2 mcg/kg) and Gomūtra bhāvita jalakumbhī bhasma (270 mg/kg bd) for another successive 21 days.

24 male Wistar albino rats were divided into 4 groups of 6 rats each. Group I: Vehicle control (VC), Group II: Disease control (DC), Group III: Standard control (Thyroxine sodium) (TX), Group IV: Classical control (Gomūtrabhāvita jalakumbhī bhasma) (JBG).

In hypothyroid rats, the body weight gain was 30 gm during the whole experimental period, which is very low as compared to the vehicle control weight gain of 108 gm. It means that the growth rate in rat decreases with hypothydorism. Similar findings have been reported earlier in case of animal testing by previous researches.[14,15,16] Normal control group animals continued to grow throughout the experiment period, generally, the rate of growth of body weight is inversely proportional to the age of rat. After treatment with Thyroxine sodium, weight significantly increased as compared to DC. The weight of JBG group rats increased but not reached to the level that show statistically significant

difference in comparison to disease control group after treatment.

Normal thyroid hormonal status was not perfectly restored similar to normal control group rats even when Thyroxine was given. This is suggestive of the disturbance of the hormonal balance in the Carbimazole induced groups, accompanied with deficiency of growth hormone, rather than a simple lack of thyroid hormones.[17]

One-way ANOVA analysis showed all studied parameters to have non-significant difference in intergroup comparison before induction. This result revealed that all the rats before induction were healthy and had normal thyroid hormone parameters. Significant decrease in the total T4 and T3 levels and increase in TSH level pointed out that administrated dose and duration of the induction was sufficient to induce hypothyroid status in experimental group of rats. In group 2, 3 and 4 the variation in the T3 and T4 levels have a similar trend, which implies that the method and procedure of animal testing were efficient and reliable for hypothyroidism.

Group VC showed no significant result during whole study period. This gives evidence that the environmental conditions did not possess any adverse effect on thyroid profile.

In group DC, T4, T3 and TSH were found statistically significant after study. The animals achieved significant alteration toward normal ranges, but not upto the normal levels. The differences in values may be due to escape from the blocking effects of Carbimazole or from the diet, but the effects were not adequate to maintain normal bodily functions.

TX and JBG group showed highly significant difference in all thyroid parameters when compared with DC group after study. The therapeutic effect of JBG against Carbimazole induced oxidative stress produced in thyroid gland may be related to selenium present in the drug. Selenium enhances the synthesis of antioxidant selenoproteine i.e., glutathione peroxidase, which protects thyroid gland from peroxidative damage.[18] Therefore, antioxidant defence system may protect the gland against Carbimazole toxicity.[19] The presence of iodine and other trace elements responsible for synthesis of T4 and its deiodination, forms a better rational to bring back thyroid hormonal status. The other pharmacological properties of jalakumbhī and gomūtra, revitalise normal physiological thyroid functioning.

Comparison between group TX and JBG revealed that T3 and TSH levels were statistically significant and T4 was not significant when compared with each other. This proved similar efficacy of JBG and TX in relation to T4 metabolism. Gomūtra significantly increases the thyroxine levels in hypothyroid rats because of its ample levels of iodine content which is easily absorbed from gastrointestinal tract.[20] Thus gomūtra helps restore the activity of thyroid glands with normal colloid and desquamation of follicular cells.[21]

Conclusion

In conclusion it can be stated that both Gomūtrabhāvita jalakumbhī bhasma and thyroxine sodium normalised all thyroid parameters studied such as T4, T3 and TSH. Presence of iodine and selenium in the drug are believed to be responsible to restore thyroid profile. Therefore, JBG will be beneficial in deficiency of these elements. Even though JBG effectively regulated thyroid hormones, it had little effect on correcting body weight. This suggests that JBG is a better drug for humans where hypothyroidism is mostly associated with obesity.

Acknowledgment

Inputs from Mr. Manish P. Deshmukh, Secretary, Institutional Animal Ethical Committee, DMIMS (DU), Sawangi, Wardha, Maharashtra are thankfully acknowledged.

Reference

1. Dixit Y., Panda S. and Kar A. Lagenaria siceraria Peel Extract in the Regulation of Hyperthyroidism, Hyperglycemia and Lipid peroxidation in mice, *International Journal of Biomedical and Pharmaceutical Sciences*, 2(2), P 79-83.

2. Sojka J. E., Hypothyroidism in horse, *Compendium on Continuing Education for the Practising Veterinarian*, 17, P 845-852, 1995.

3. Kasper Dennis L. et. al., *Harrison's Principles of Internal Medicine*, Chapter-320, P 2109, 16th Edition, 2008.

4. Satoskar R. S., Bhandarkar S. D. and Ainapure S. S., *Thyroid and antithyroidal drugs in Pharmacology and Pharmacotherapeutics*, P 871-872, 16th Edition, Popular Prakashan, Mumbai, India, 1999.

5. Lineshwala G., Singh G. and Behera B. S., Clinical study on efficacy of Bhallataka and Galgandahara vati on hypothyroidism, *Journal of Ayurveda Physicians and Surgeons*, 5(1), P 17-21, January 2018.

6. Kirtikar K. K. and Basu B. D., *The Indian Medicinal Plants*, P 3576-3579, Oriental Enterprises, Dehradun, 2001.

7. Shri Bhramashankara Mishra, *Bhavaprakash- nighantu*, Vidyotini Hindi Commentary, Part 2, Chapter Galganda adhikar, P 448, Chaukhambha Samskrit Sansthan, Varanasi,

8. Paget G. E. and Barnes J. M., *Evaluation of drug activities in Pharmacometrics*, Volume 1, P 161, Academic Press, New York, 1969.

9. *Ayurvedic Pharmacopoeia of India*, Part 1, Volume 6, P 72, 1st Edition, Government of India, Department of AYUSH, New Delhi.

10. *OECD Guidelines (420) for testing of chemicals*, 17th December 2001.

11. Shuurs A. H. and Van Weemen B. K., Review Enzyme Immunoassay, *Clinica Chimica Acta: International Journal of Clinical Chemistry*, 81:1, 1977.

12. Soos M. and Siddle K., Enzymes immune assay for the quantitative determination of TSH, *The Journal of Immunological Methods*, 51, P 57-68,1982.

13. Choi J. and Jee J. G., Repositioning of Thiourea-containing drugs as tyrosinase inhibitors, *International Journal of Molecular Sciences*, 16, P 28534-28548, 2015.

14. Diffee G. M., Haddad F., Herrick R. E. and Baldwin K. M., Control of myosin heavy chain expression: interaction of hypothyroidism and hindlimb suspension, *The American Journal of Physiology*, 261: C1099-C1106, 1991.

15. Syed M. A., Thompson M. P., Pachucki J. and Burmeister L. A., The effect of thyroid hormone on size of fat depotsaccounts for most of the changes in leptin mRNA and serum levels in the rat, *Thyroid: Official Journal of the American Thyroid Association*, 9, P 503-512, 1999.

16. Wang J. L., Chinookoswong N., Yin S. and Shi Z. Q., Calorigenic actions of leptin are additive to, but not dependent on, those of thyroid hormones, *American Journal of Physiology Endocrinology and Metabolism*, 279: E1278-1285, 2000.

17. Redmond O. and Tuffery A. R., Thyroid proliferation, body, thyrotropin and thyroid hormones in chronic antithyroid treatment in rats, Journal of Anatomy, 133 (pt.1): P 37-47, August 1981.

18. Negro R., Selenium and Thyroid autoimmunity, *Biologics: Targets and Therapy*, 2(20): P 265-273, June 2008.

19. Mahera N., Al-Shaikh et. al., *IOSR Journal of Pharmacy and Biological Sciences* (IOSR-JPBS), Feb. 2014: e-ISSN: 2278-3008, 9(1), P 24-27. www.iosrjournals.org

20. Lengemann F. W., *The Journal of Agricultural Science*, 61(3), P 375-379, 1963.

21. Anaxee B. et.al., Effect of cow urine on Thyroid hormonal profile and thyroid status in Male wistar Albino rats, *Journal of Cell and Tissue Research*, Volume 13(3), P 3839-3843, 2013.

Authors

Pooja Rani, Post Graduate Scholar, Department of Post Graduate Studies in Rasshastra and Bhaishajyakalpana, Uttarakhand Ayurved University, Risikul Campus, Haridwar, 249 401, Uttarakhand.

Khemchand Sharma, Professor and Head, Department of Post Graduate Studies in Rasshastra and Bhaishajyakalpana, Uttarakhand Ayurved University, Risikul Campus, Haridwar, 249 401, Uttarakhand.

Shuchi Mitra, Associate Professor, Department of Post Graduate Studies in Rasshastra and Bhaishajyakalpana, Uttarakhand Ayurved University, Risikul Campus, Haridwar, 249 401, Uttarakhand.

DRUG REVIEW

Āryavaidyan, Vol. XXXIII, No. 3, February - April 2020, Pages 20 - 25

Drug review and a phyto-pharmacognostical evaluation of folklore plant Bṛhatcakramarda (*Cassia alata* L.)

Shyni C., Gururaj Kulkarni S., Shashidhar Sarwad S. and Nandan Hodlur S.

ABSTRACT: In India, about 70 percent of rural population depends on the traditional āyurveda system of medicine. Most local healers or practitioners of the traditional systems of medicine prepare their own formulations and dispense to the patients. In āyurveda *Cassia alata* L. is known as Bṛhatcakramarda.[1]It is a large handsome shrub,which is found throughout the plains of India. This plant is used as a folkmedicine in Kerala for the treatment of skin diseases like scabies, eczema, pruritus, ring worm infections and other fungal infections, etc.[2,3]But there is no much information available on this drug in various āyurveda texts. The present article is aimed to provide a broad pharmacognostical study and review on bṛhatcakramarda.

Key words: *Cassia alata* L., Drug review, Pharmacognostical study

Introduction

Among the 35 tribal communities in Kerala, the major ones are Urali, Paniyan, Kapu, Kanikkar, Kadar, Irula and Mala arayan, all these tribal groups have developed their own traditional systems of medicines and follows special diets to cure the diseases. The herbs are collected from near and around their settlements and are prepared and served directly to the patient. The most remarkable fact is that a single plant is used in different ways and for different types of diseases. One such plant is called as ānattakara or bṛhatcakramarda (*Cassia alata* L.) belonging to the family Caesalpinioideae, is a pantropical ornamental shrub, distributed from tropical America to India.[4,5]

The drug *Cassia alata* L. has not been mentioned in any of the āyurveda classics. The reference of this particular drug is not seen in any of the Veda, Samhitā and Nighaṇṭū. Hence, this drug does not have a Sanskrit name or descriptions. But in edited version of Madanapālanighaṇṭu the word bṛhatcakramarda (*Cassia alata* L.) is mentioned under the heading abhayādivarga.

Cassia alata L. (ānattakara) is widely used in southern parts of Kerala by folklore practitioners for skin diseases but, it is not yet documented in āyurveda. So, this is the first study on the drug *Cassia alata* L. in the field of āyurveda as it is a folklore drug for fungal diseases.

Drug review

Botanical discription

Latin name: *Cassia alata* L.

Family: Caesalpinioideae

Vernacular names[6]

English	:	Candle bush
Kannada	:	Ānattakaḍai
Malayalam	:	Ānattakara
Hindi	:	Dadmurdan
Tamil	:	Malantakerai

Synonyms: Bṛhatcakramarda,[1] Dadrughna.[12]

Classification of the drug

The ancient authors classified the drug on the basis of their morphological characters, properties, pharmacodynamics as well as therapeutic values. The classification goes as follows. It is clearly mentioned under the abhayādivarga in Madanapālanighaṇṭu (Edited version).

Botanical description of the plant[7]

A large handsome shrub or a small tree 1-5 cm in height. Branches are thick downy. Leaves are sub sessile glandless 30-60 cm long, with persistant stipules, leaflets 8-12 pairs, 5-15 cm *2.5-5 cm oblong glabrous above. Flowers bright yellow in dense, paniculate racemes. Fruits pods 10- 20 cm long with a broad wing. Seeds flattened triangular 50 or more.

Distribution[8]

Cassia alata L. grows in seasonally flooding shrub lands. It is quite common in all districts of Kerala.

Chemical constituents:[9, 10] Table 1.

Table 1
Chemical constituents

References	Leaves	POD	Seed	Root	Flower
Wealth of India (WOI) Treatise on Indian Medicinal Plants (TIM)	Aloe emodin, chrysophanol, iso-chrysophanol, rhein, physcion, glucoside	Aloe emodin, Emodin, Rhein	Chrysophanol, 2-methyl anthraquinone. Beta sitosterol	1,3,8 trihydroxy 2-methyl anthraquinone, 1,5 dihydroxy-8-metoxy, 2-methyl anthraquinone, 3-od+ glycopyrnoside	Saponin Anthraquinone

Empirical uses

Ring worm infection[11,12]: The leaf paste of *Cassia alata* L. mixed with lime juice and applied over the affected site. Root decoction is used for external application.

Eczema[13]: Strong decoction of the leaves and flowers can be used for washing the affected part.

Skin disease[14]: Pounded fresh leaves are rubbed in the affected site.

Itching: The leaves are crushed and mixed with black pepper and applied externally.

Scorpion bite[15]: Any part of the plant is made in to a paste and applied to the sting .

Herpes eczema mycosis[9a]: Leaf juice or decoction is used externally for cleaning the area.

Pharmacognostical study

Macroscopic description: Figure 1.

Leaves: Leaves are paripinnately compound dark green, oblong-obovate, in shape asymmetrical base, entire margin retuse apex and reticulate venation.

Flower: Spike inflorescence with yellow color.

Fruit: Legume type fruit, it is brown in color.

Stem: Multi trunked in nature (more than one main trunk or stem).

Figure 1
Macroscopic description of *Cassia alata* L.

Microscopical study: Figures 2 to 6

Leaves: The leaves contains fibers, palisade tissue, phloem, pith cells, schlerenchyma, spongy paranchyma cells, trichome and xylem cells were seen in leaves.

Root: The root contains cork, cortex, calcium oxalate crystals, fibres, medullary rays, pericyclic fibres, phloem, phloem fibres, xylem and vessels were seen in root.

Stem: The stem contains fibre, medullary rays, cork, cortex, calcium oxalate crystals, medullary rays pericyclic fibres, phloem, phloem fibres, stone cells, trichome, xylem and vessels were seen in stem.

Leaf powder: Parenchyma cells, trichome, calcium

oxalate, mesophyll and stomata were seen in leaf powder.

Figure 2
Leaf microscopy of *Cassia alata* L.

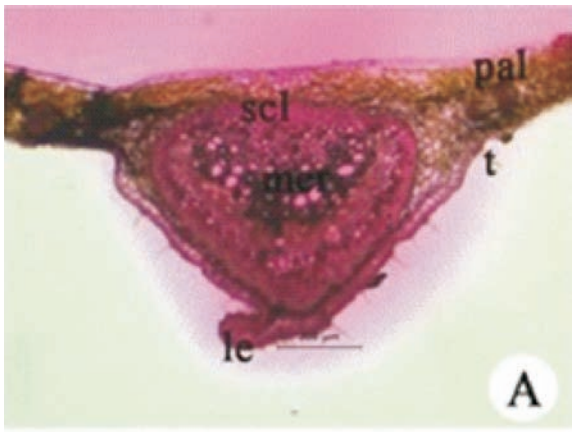


Figure 3
Stem microscopy of *Cassia alata* L.

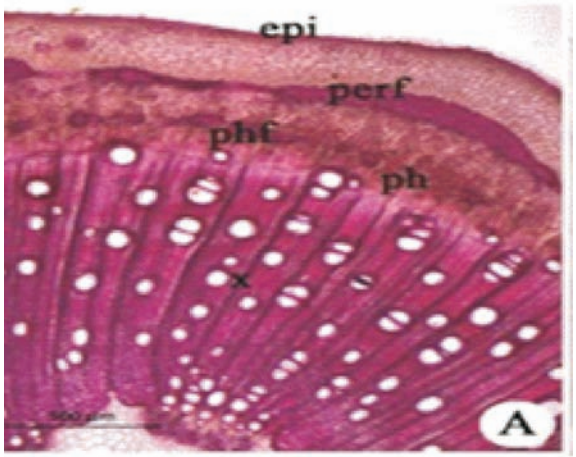


Figure 4
Root microscopy of *Cassia alata* L.

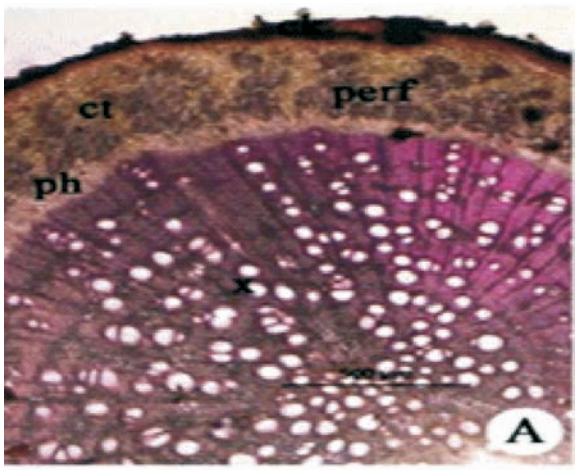


Figure 5
Upper epidermis in surface view with stomata

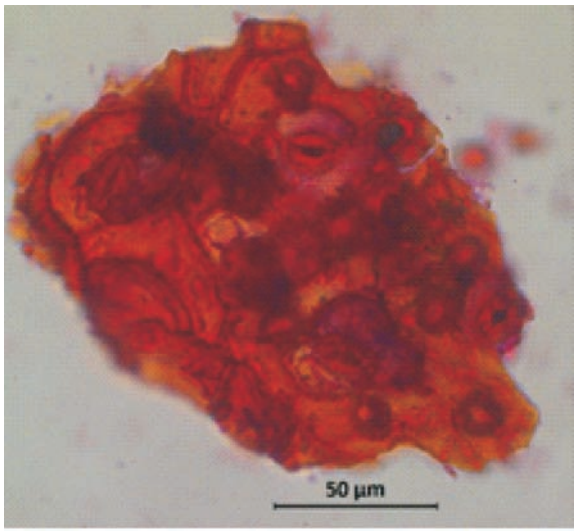
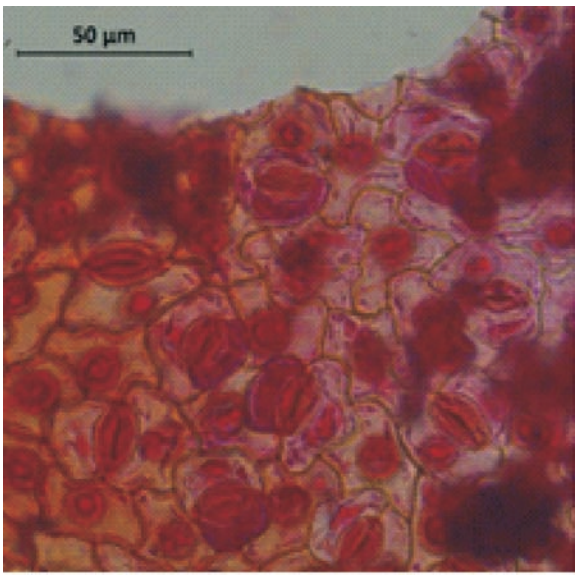


Figure 6
Lower epidermis in surface view with stomata



Phyto-chemical study

Methodology of phytochemical study

Source of plant material, collection and authentication: The drug was identified and authenticated by the botanist at Regional Research Institute, Thiruvananthapuram, Kerala. 6 Kgs of botanically identified *Cassia alata* leaves were collected from Odayam, Varkala, Thiruvananthapuram, Kerala.

Preparation of coarse powder

Cassia alata leaves were coarsely powdered.

Approximately 750.0gms of powder was obtained. The coarse powder was stored in air tight container.

Hot continuous extraction (Soxhlet extraction)

For exhaustive extraction about 750gm of *Cassia alata* coarse powder was used by soxhlet apparatus around complete extraction of the drug into totally 3 cycles, About 250 gm of *cassia alata* leaf powder was placed in the extraction thimble for each cycle of extraction and about 170gm of extraction was obtained for further analysis. Consistency of ethanol extracts were waxy, semisolid blackish green in colour. Table 2 is showing calculation of obtained extraction and Table 3 is showing the phytochemical analysis of *C. alata*.

Table 2
Calculation of obtained extraction

Powder of *cassia alata* L.	Solvent	Observation	Extract
750gms	3500ml	Greenish black	170gms

Table 3
Phytochemical analysis of *Cassia alata* L.

Sl.No.	Physicochemical test	Result
1.	Foreign matter	0.1%
2.	Total ash	4%
3.	Acid Insoluble ash	0.5%
	Extractive value	
4.	Alcohol soluble extract value	21.6%
5.	Water soluble extract value	25.6%
6.	Petroleum ether extract value	5.6%
7.	Moisture content	1%
8.	p^H	7

Results of physicochemical study

Foreign matter:The difference between drug and foreign matter is 0.01%, indicates the foreign matter detected is very less which shows the drug is devoid of impurities.

Ash values:The total ash value, acid insoluble ash was found to be 4% and 0.5% respectively. This percentage clearly indicates that the leaves of *Cassia alata* have potent action and effects.

Extractive values:The water-soluble extractive value, alcohol extractive values and petroleum ether extractive values were found to be 25.6%, 21.6% and 5.6% respectively.

The water soluble extractive value proved to be 25.6%. This shows that the constituents of drug are more extracted and soluble in water as compared to alcohol. The alcohol soluble extractive value proved to be 21.6%. This shows that the constituents of drug are more extracted and soluble in alcohol as compared to petroleum ether.

Moisture content: 1% of moisture content during the procedures showed a higher stability for the sample.

p^H value: p^H is a scale used to specify how acidic or basic a water based solution. Weak acid is absorbed at a faster rate from stomach but many uncharged drugs can not be absorbed or they are insufficiently lipid soluble like aminoglycosides. In this study p^H was 7, which is neutral in nature. Table 4 is showing the phytochemical study report.

Table 4
Phytochemical study report

Phytochemicals	Tests	Grading
I. Alkaloids	1. Mayers reagent	++
	2. Hagers reagent	++
	3. Wagners reagent	++
	4. Dragendroff's test	+++
II. Glycosides	1. Borntragers test	++
	2. Baljet test	++
III. Phyto sterols	1. Salkowski test	+++
	2. Lieberman Burchardt test	++
IV. Saponins	1. Foam test	—
V. Tannins and Phenolic Compounds	1. $Fecl_3$ Solution test	++
	2. Lead acetate solution	+++
	3. Dilute HNO_3 test	++
VI. Starch	1. Iodine Lieber test	—

Result and discussion of analytical study

The phytochemical study of *Cassia alata* has been carried out with one extraction that is; ethanolic extract. In *Cassia alata* extracts the presence of several phytochemicals such as alkaloids, glycosides, phytosterols, tannins, phenolic compounds, flavanoids and carbohydrates were detected. Some of the other phytochemical constituents like saponins, aminoacids, proteins and starch were not detected. This might be responsible for the anti-fungal activity.

HPTLC with finger printing: See Figures 7- 10.

Figure 7

HPTLC with finger printing of *Cassia alata* L.

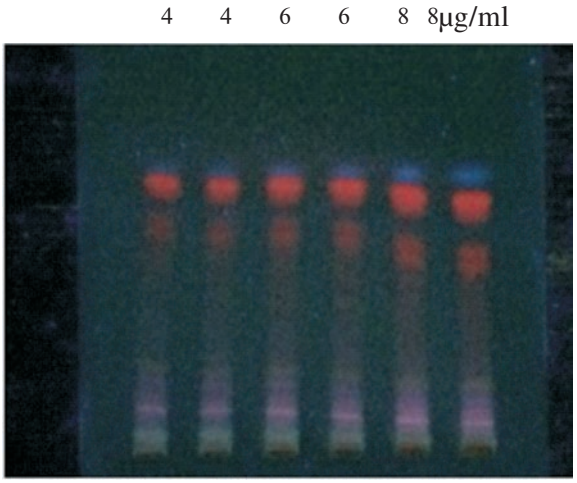


Figure 8

HPTLC Chromatoplate of CL extract (spot:1,2 4µg/ml, SPOT:3,4 6µg/ml, SPOT:5,6 8µg/ml).

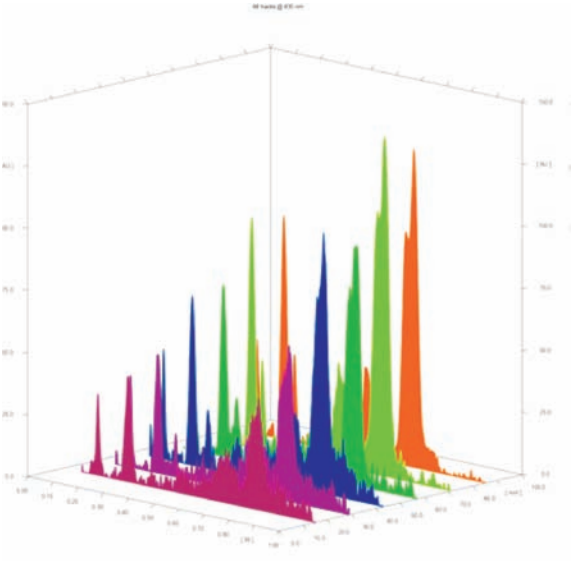


Figure 9

Densitometric chromatogram at 430 nm.

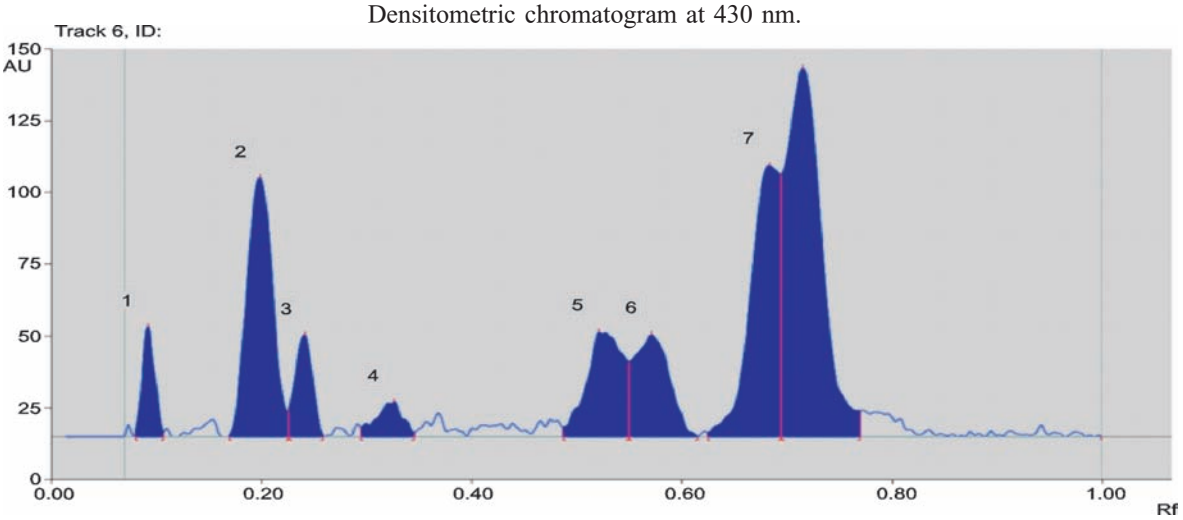


Figure 10

HPTLC Study report

CL@431 nm.cna* winCATS

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %	Assigned substance
1	0.08 Rf	1.2 AU	0.09 Rf	38.2 AU	8.12 %	0.11 Rf	1.6 AU	375.0 AU	3.40 %	unknown *
2	0.17 Rf	0.2 AU	0.20 Rf	90.2 AU	19.16 %	0.23 Rf	8.8 AU	862.7 AU	16.90 %	unknown *
3	0.23 Rf	9.6 AU	0.24 Rf	35.4 AU	7.52 %	0.26 Rf	0.3 AU	487.2 AU	4.42 %	unknown *
4	0.29 Rf	3.4 AU	0.33 Rf	12.2 AU	2.59 %	0.35 Rf	1.4 AU	263.7 AU	2.39 %	unknown *
5	0.49 Rf	3.3 AU	0.52 Rf	36.5 AU	7.75 %	0.55 Rf	5.2 AU	078.2 AU	9.78 %	unknown *
6	0.55 Rf	16.3 AU	0.57 Rf	35.6 AU	7.55 %	0.62 Rf	0.1 AU	019.6 AU	9.25 %	unknown *
7	0.63 Rf	1.5 AU	0.68 Rf	94.3 AU	20.04 %	0.69 Rf	1.4 AU	219.1 AU	20.13 %	unknown *
8	0.70 Rf	11.4 AU	0.72 Rf	28.3 AU	27.26 %	0.77 Rf	9.1 AU	719.3 AU	13.74 %	unknown *

Discussion and result of HPTLC

HPTLC fingerprint studies confirmed the results of phytochemical screening by the presence of various coloured bands at different wavelength with specific solvent systems, symbolizing the presence of particular phytocompounds.

In ethanol extracts of sample (CL) 254 nm, 6 unknown constituents were separated respectively, observed at Rf 0.08, 0.17, 0.23, 0.29, 0.49, 0.55, 0.63 and 0.70.

Conclusion

The plant *Cassia alata* L. taken for our study is found to have broad spectrum of secondary metabolites such as flavoinoids, anthraquinones, tannins, etc. Further phytochemical researches on *C. alata* may serve as leads in the development of new pharmaceuticals.

Acknowledgement

Authors are sincerely thankful to Dr. Poornima J. and Dr. Ashwini H., Department of Post Graduate Studies in Dravyaguna, BVVS Ayurved Medical College, Bagalkot, Karnataka, is gratefully acknowledged for the constant support during the study.

Reference

1. Sastry J. L. N., *Madanapalanighantu*, P 194, 1st Edition, Chaukhabha Orientalia, Varanasi, 2010 .

2. Dahanukar S. A., Kulkarni R. A. and Rege N. N., Pharmacoloy of medicinal plants and natural products, *Indian Journal of Pharmacology*, 32:P81-118, 2000. Cowan M. M., Plant products as anti-microbialagents. *Clinical Microbiology Reviews*;12, P 564-582, 1999. [PMC free article]

3. Ramasamy S. and Charles M. A., Antibacterial effect of volatile components of selected medicinal plants against human pathogens, *Asian Journal of Microbiology, Biotechnology and Environmental Sciences*, 6, P 209- 210, 2009.

4. Seaforth C. E., *Cassia*, Tropical science, Volume 4, P 159, 1962.

5. Hennebelle T., Weniger B., Joseph H., Sahpaz S. and Bailleul F., *Senna alata*, *Fitoterapia*, 80(7): P 385-393, 2009.

6. Abbasi A. M., Khan M. A., Ahmad M., Zafar M., Jahan S. and Sultana S., Ethno pharmacological application of medicinal plants to cure skin diseases and in folk cosmetics among the tribal communities of North-West Frontier Province, Pakistan, *Journal of Ethnopharmacology*,128: P 322-335, 2010.

7. Suresh M., Ayyanar M., Amalraj L. and Mehalingam P., Ethnomedicinal plants usedto treat skin diseases in Pothigai hills of Western Ghats,Tirunelveli district, Tamil Nadu,India. *Journal of Biosciences*, 3:112-121, 2012.

8. Saikia A. P., Ryakala V. K., Sharma P., Goswami P. and Bora U., Ethnobotany of medicinal plants used by Assamese people for various skin ailments and cosmetics, *Journal of Ethnopharmacology*, 106: P 149-157, 2006.

9. *The Wealth of India: A Dictionary of Indian Raw materials and Industrial products*, Volume 3, P 332, New Delhi, 1992.

9a. Ibidem., Volume 3, P 332-336.

10. Satyesh Chandra Prakrashi, *The Treatise on Indian Medicinal Plants*, Volume 2, P 34-35, 2nd Reprint edition, CSIR, New Delhi.

11. Gopalakrishna Bhat K., *Flora of Udupi dist.*, 1st Edition, P 183-184, 2003.

12. Lt.Colonel Kirtikar K. R. and Major Basu B. D., *Indian Medicinal Plants,* Volume 2, P 870, 2nd Revised edition, 2012.

13. Tamarakulam Kochusankaran Vaidyar G., *Ayurveda Aushadhinighantu*, P 479, Reddiyar Press and Book Dippo, Thiruvananthapuram.

14. Muraleedaran Pilla K., *Oushadasasyagalude Citragalum Ottamoolikalum*, P 1-321, Tatwamasi Publication.

15. Govinda Menon K., *Bharatiya Aushadhachedikal*, P 142, Ramanujalayam, Trichur.

Authors

Shyni C., Post Graduate Scholar, Department of Post Graduate Studies in Dravyaguna, B.V.V.S. Ayurved Medical College and Hospital, Bagalkot, Karnataka.

Gururaj Kulkarni S., Professor and Head, Department of Post Graduate Studies in Dravyaguna, B.V.V.S. Ayurved Medical College and Hospital, Bagalkot, Karnataka.

Shashidhar Sarwad S., Associate Professor, Department of Post Graduate Studies in Dravyaguna, B.V.V.S. Ayurved Medical College and Hospital, Bagalkot, Karnataka.

Nandan Hodlur S., Lecturer, Department of Post Graduate Studies in Dravyaguna, B.V.V.S. Ayurved Medical College and Hospital, Bagalkot, Karnataka.

CASE STUDY

Āryavaidyan, Vol. XXXIII, No. 3, February - April 2020, Pages 26 - 28

Management of Ureteric calculi by āyurveda: a case study

Rishu Sharma, Gyanendra Datta Shukla and Sharma K. K.

ABSTRACT: Urinary calculi is one of the common painful urinary tract disorder. It has a high prevalence rate, usually affecting 10-12% of the total population. It is characterized by frequent micturition, intermittent pain occasionally radiating to flanks, sweating and restlessness during the episodes of pain. In the conventional system of medicine, endoscopic procedures like ureterostomy, percutaneous nephrolithiotomy and extracorporeal shockwave lithotripsy are the treatment of choice. In this study, a non-invasive and safe protocol was designed for the management of this entity. A 60 year old female who arrived at Panchkarma OPD of Rishikul Hospital with intermittent pain often radiating to right flank, burning micturition and decreased frequency of micturition was managed by āyurvedic intervention for a period of 9 months and evaluated by symptomatic assessment and USG. The response was quite encouraging in terms of dissolution and expulsion of the ureteric calculus.

Key words: Urinary calculi, Ureterostomy, Percutaneous nephrolithiotomy, Extracorporeal shockwave lithotripsy

Introduction

The ureters arise from the pelvis of each kidney and descend anterio-superiorly to the psoas major muscle to reach the brim of the pelvis. These are made up of smooth muscles and help propel urine from the kidneys to the urinary bladder. In the adult, ureters are usually 25- 30 cm in length and around 3- 4 mm in diameter. They cross anterior to the common iliac arteries. Coursing down along the lateral aspect of the pelvis, they curve forwards and enter the bladder from both sides of the bladder posteriorly. A kidney stone traversing from the kidneys down, may be entrapped inside the ureter in its downward course inside the ureter, which apart from blocking the flow of urine, causes sharp cramps at the back, sides, or lower abdomen.[1] The affected kidney could then become swollen, the condition being known as hydronephrosis due to back eddies of urine due to its obstruction.[2] The strategic anatomical sites in the ureter, where a descending renal stone is likely to be impacted due to extra luminal constrictions or curvatures of ureter are three:

1. At the ureteric junction of renal pelvis;

2. As the ureter passes over the iliac vessels;

3. Where the ureter enters into the urinary bladder (vesico-ureteral junction).

Case study

A 60 year old female patient came to the Outpatient Department of Panchakarma, Rishikul Ayurvedic College, Haridwar, with complaints of pain and numbness in right flanks and pain in coccyx on sitting. The pain was colicky in nature and varied in intensity, lasting a few minutes, causing sweating, pallor, abdominal distension and occasional nausea. Patient gives a surgical history of hysterectomy.

On physical examination, tenderness was elicited in the suprapubic region and right renal angle.

Investigations

Ultrasound scan of patient revealed right ureteric calculus at upper pelvis of 4.5 mm.

Clinical features along with the ultrasound report is corroborative of ureteric calculi. Based on symptomatic assessment, the case was diagnosed as vātaja aśmarī.

Materials and methods

The patient was advised the following drugs for 1 month along with routine follow up every 15 days.

1. Punarnava maṇḍūra: 250 mg
   Śveta parpaṭi: 250 mg
   Hazral Yahud bhasma: 250 mg
   Yavakṣāra: 250 mg
   Giloy satva: 4 gms

The combination was given in a dose of 5 gms, twice a day after meals.

2. Gokṣurādi guggulu: 2 tablets BD after meals.

3. Varuṇaśigru kvātha: 40 ml BD

The kvātha was given twice a day on empty stomach.

Result

After 30 days of treatment, patient got mild relief to pain but no change in the Ultrasound report. She was advised to continue the treatment with regular follow ups every 15 days on OPD basis. After a period of 9 months, the patient was completely relieved of pain. Ultrasonography findings revealed normal KUB appearance with no evidence of calculi. Table 1.

Table 1
Showing changes in Subjective and Objective parameters

Subjective symptoms		
Symptoms	Before treatment	After treatment
Pain and numbness in right flanks region.	Present	Absent
Pain at coccyx on sitting	Present	Absent
Nausea, abdominal distention	Present	Absent
Objective symptoms		
Tenderness in right renal angle	Present	Absent
USG Abdomen/ pelvis	Rt. Ureteric caculi (4.5mm in upper pelvis)	KUB appearance normal.

Discussion

In the present era, the options of management of urinary calculi are plenty: surgery, shockwave lithotripsy, etc. Tamsulosin and corticosteroid are the most employed efficacious combination, which helps the passage of stones more quickly. The need for analgesics is also reduced.[3] The patients treated with alfuzosin also require fewer analgesics and less surgical interventions like ureteroscopic lithotripsy and/or extracorporeal shock wave lithotripsy.[4] Adverse effects of these therapies are still not recognized/ published. Traditional medicines have been used to treat urinary calculi since the origin of civilization. World Health Organization has also emphasized development and utilization of herbal drugs and traditional medicare for the benefit of the sufferers of urolithiasis, in terms of cost effectiveness and negligible adverse effects of these drugs. The organization has also estimated that about 80% of the population living in developing countries rely on traditional medicine for healthcare needs.[5] Āyurveda, the Indian traditional system of medicine has lot to offere in the management of ureteric calculi. The condition is documented as aśmari in the classical literature of āyurveda. The principal factor of pathogenesis of aśmari is identified as kaphadoṣa vitiation. This is held to be the nucleus of the pathogenesis. When the urine becomes stagnant in its system for long time, it gets concentrated and infected. This provides the nidus for stone formation. Hence, the main aim of the treatment must be kaphahara, lekhana (scraping) and mūtraḷa (diuretic). Śveta parpaṭi[6] helps flush out the calculi due to its potent diuretic action. One other factor of aśmari formation is agnimāndya which causes sluggishness in urine flow and obstruction in urinary system (mūtravaha srotas), ultimately being responsible for formation of urinary calculi. Most of the ingredients of Gokṣurādi guggulu have āmapācana and agni sandīpana properties.[7] The decoction Varuṇaśigru kvātha contains raw drugs[8] that has multisystem activity. It has properties of crushing the stone, diuretic, kaphaśāmaka and antiseptic. The potent lithotripsy activity of Gokṣurādi guggulu and Śveta parpaṭi was revealed in earlier studies also.[9] Yavakṣāra contains potassium chloride, potassium sulphate, potassium bicarbonate and potassium carbonate. This drug is useful in the pathogenesis prevailing in many disases like amḷapitta, aśmari, mūtrakṛccha, udaraśūla, gulma and arśa. Yavakṣāra is diuretic and resolvent, it is used to remove obstruction in passages especially in urinary tract diseases like colic, chronic dysuria and in painful micturition.[10] It is also used in conditions of uric acid diathesis.[10] Hazrool Yahood bhasma is a rich source

of magnesium hydroxide [$Mg(OH)_2$] which react with calcium oxalate calculus and forms magnesium oxalate soluble complex.[11,12] This process helps disintegration of large calculi into the smaller particles. Punarnavamaṇḍūra is known to have properties of mūtraḷa (diuretic) and śothahara (anti-inflammatory). Contents of Punarnavamaṇḍūra are kaṣāya (astringent), kaṭu (hot), laghu (light), rūkṣa (dry), śīta (cold) and pittakaphaśāmaka. Punarnavā is anulomana, mūtraḷa (diuretic) and has been proved as hepatoprotective and antioxidant.[13, 14, 15, 16]

Conclusion

Ureteric calculi are not uncommon in Indian population and its incidence appears to increase by the day. Preserving renal function and attaining a stone-free state while minimizing patient discomfort and disability are the chief aims of the therapeutic strategy. Careful consideration of the treatment options from alternative sciences with involvement of modern assessment parameters like USG provides successful outcome with minimal morbidity. The present study showcases the efficacy of an āyurveda intervention as an effective and safe alternate in the management of ureteric calculi by expelling the stones after safely reducing their size. This single case study needs to be evaluated on a larger study population.

Acknowledgement: None

Reference

1. *Symptoms of Kidney Stones*, Medical Bug, 1 January 2012, Retrieved 11 April 2012.

2. Resnick Martin I., Lam Mildred and Zipp Thomas, Kidney Stones, (4 September 2009), *Netwellness*, Retrieved 11 April 2012.

3. Gravina G. L., Costa A. M., Ronchi P., Galatioto G. P., Angelucci A., Castellani D., Federico Narcisi and Carlo Vicentini, Tamsulosin treatment increases clinical success rate of single extracorporeal shock wave lithotripsy of renal stones, *Urology*, 66(1), P 24- 28, 2005.

4. Chau L. H., Tai D. C., Fung B. T., Li J. C., Fan C. W. and Li M. K., Medical expulsive therapy using alfuzosin for patient presenting with ureteral stone less than 10 mm: A prospective randomized controlled trial, *International Journal of Urology*, Official Journal of the Japanese Urological Association, 18, P 510-514, 2011.

5. *World Health Organization Monographs on Selected Medicinal Plants*, World Health Organization, Geneva, 2002.

6. Acharya Y. T., *Siddhayogsangrah*, P 98, Baidyanath Ayurveda Bhawan, Nagpur, 1979.

7. Susruta, *Susrutasamhita*, Ayurvedatatvasandipika Commentary by Ambikadatta Shastri, Part I, Nidanasthanam 3/3, P 312, Reprint edition, Chaukhambha Sanskrit Sansthana Varanasi, 2010.

8. *The Ayurvedic Pharmacopoeia of India*, Department of AYUSH, Government of India, Ministry of Health and Family Welfare, New Delhi, 2008.

9. Chakradhar K. V., A comparative clinical study on Renal calculi-an Ayurvedic perspective, *IOSR Journal of Dental and Medical Sciences*, 2(5):21-32, 2012.

10. Nadkarni K. M., *Indian Materia Medica*, Volume 2, Bombay Popular Prakashan, 89, 1994.

11. Krishan Gopal, *Rastantrasara va Siddhaprayoga-sangraha*, Volume 1, P 653, Krishan Gopal Ayurvedic Dharmartha Oushadha, Bogala, Ajmeer, 1947

12. Johansson G., et. al., Effects of Magnesium hydroxide in Renal stone disease, *Journal of the American College of Nutrition*, 1 (2), P 179- 185, 1982.

13. Chandan B. K., Sharma A. K. and Anand K. K., *Boerhavia diffusa*: A study of its hepatoprotective activity, *Journal of Ethnopharmacology*, 31(3), P 299-307, 1991.

14. Mungantiwar A. A., Nair A. M., Shinde U. A., Dikshit V. J., Saraf M. N., Thakur V. S. and Sainis K. B., Studies on the immunomodulatory effects of *Boerhavia diffusa* alkaloidal fraction, *Journal of Ethnopharmacology*, 65(2), P 125-31, 1999.

15. Rawat A. K., Mehrotra S., Tripathi S. C. and Shome U., Hepatoprotective activity of *Boerhavia diffusa* L. roots- A popular Indian ethnomedicine, *Journal of Ethnopharmacology*, 56 (1), P 61-6, 1997.

16. Agrawal B., Das S. and Pandey A., *Boerhavia diffusa* Linn: A review on its phytochemical and pharmacological profi le, *Asian Journal of Applied Sciences*, 4(7), P 663-84, 2011.

Authors

Rishu Sharma, Post Graduate Scholar, Department of Panchakarma, Rishikul Campus, UAU, Haridwar, Uttarakhand.

Gyanendra Datta Shukla, Associate Professor, Department of Panchakarma, Gurukul Campus, UAU, Haridwar, Uttarakhand.

Sharma K.K., Professor and Head, Department of Panchakarma, Rishikul Campus, UAU, Haridwar, Uttarakhand.

ANALYTICAL REVIEW

Āryavaidyan, Vol. XXXIII, No. 3, February - April 2020, Pages 29 - 33

Role of Pañcakarma in Vyaṅga *vis-a-vis* Melasma: analytical review

Pretya Juyal, Divya Aswal, Sharma K. K., Alok Kumar Srivastava and Parul Sharma

ABSTRACT: In āyurveda, skin ailments are mostly mentioned under kuṣṭha and kṣudraroga. On the basis of symptoms, vyaṅga can be correlated with melasma. Melasma is a common, acquired and symmetrical hypermelanosis characterized by more or less dark brownish maculae, with irregular contour, but clear limits, on photoexposed areas, especially the face, forehead, temples and more rarely on the nose, eyelids, chin and upper lips. Various factors like genetic predisposition, UV rays, cosmetics and hormonal drugs plays a very important role in the pathogenesis of melasma. Āyurveda classics have described many remedies both internal medicine as well as external applications for skin disorders. All accessory factors are also important during the management of diseases e.g. psychological conditions, cosmetics, oral contracepting pill, some drugs, etc. Drugs with raktaprasādaka, tvakprasādaka and varṇyakara properties are helpful in the management of vyaṅga, that pacifies the aggravated doṣa and helps in raktaśodhana (blood purification).

Key words: Vyaṅga, Kṣudraroga, Raktapradoṣaja, Melasma

Introduction

Beauty starts with healthy skin; it is a reflection of overall wellness. Along with increased demand of beautification, now a day's people spent much more money for the enhancement of beauty. In this time of globalization, personality damaging disorders are also increasing at a very fast rate. Among them, vyaṅga is such a condition which affects the beauty as well as personality. On the basis of signs and symptoms, vyaṅga can be corelated with melasma. Prevalence rate of melasma varies between 1.5% and 33.3% depending on the population.[1,2] Its prevalence in pregnancy is around 50-70%.[3,4] The disease prevalence among Asians is about 40% in females and about 20% in males.[5] Melasma is the most common pigmentary disorder in India, with incidence of approximately 10%.[6] It is also found to occur at a younger age among Indians.[7]

The etiological factors like krodha, śoka, śrama, etc. and pathogenesis of vyaṅga are explained in āyurveda. Doṣa involvement in vyaṅga is vāta and pitta doṣa and these doṣa along with other causative factors produce vyaṅga on face region. In modern medical science, topical steroids have been mentioned in the management of facial melanosis.[8] Even, the topical steroids have adverse effects such as irritation, rashes on skin, etc.[9] Apart from this, generally the topical steroids are expensive and sometimes poor patients cannot afford this treatment. Therefore, there is a need of framework for suitable diagnosis and accurate treatment. It is possible only if we have proper knowledge regarding the pathological condition of the disease and manifestation of signs and symptoms. As the disease vyaṅga is coming under yāpyavyādhi and treatment remedies are also minimum, hence, there is need of the hour to search for better methods of management in facial melanosis considering the above drawbacks. Āyurveda mentions a proper management for skin care. Massage with oils, application of paste of medicines, etc. makes the face smooth, soft and glowing.[10] In addition to this, raktamokṣa (bloodletting) and nasya is also described.[11]

Disease review

The literary meaning of vyaṅga is 'vi + aṅga' i.e

vikṛtāṅga ('vi' means vikṛta, vigata or vikala). Description about vyaṅga is found in almost all the āyurveda classics. Both Carakasamhitā and Suśrutasamhitā considers vyaṅga as a 'raktajaroga'. It is a disease which belongs to svalpa variety of kṣudraroga. As the name suggests kṣudraroga are those group of disorders which are basically characterized by alparūpa or these are also termed as alpavyādhi (Śabdakalpadruma). They are also known as svalpa, adhama or krūravyādhi. Doṣa which are responsible for disease are aggravated due to krodha and āyāsa. Aṣṭāṅgasamgrahaḥ and Aṣṭāṅgahṛdayam has mentioned śoka and krodha as the main causes for vyaṅga. According to ācārya Suśruta, lohita (second layer of tvak) is the seat of vyaṅga.

In vyaṅga, there is dominance of śārīrikadoṣa like pitta and vāta. These doṣa along with factors like krodha, śoka and āyāsa vitiates the agni which resides in rasa and initiates the pathogenesis of vyaṅga. As we know rañjakapitta is responsible for the conversion of rasadhātu into raktadhātu which results in the formation of normal skin colour. Due to etiological factors mainly pitta vitiation takes place which affects the jaṭharāgni and normal functioning of rañjakapitta i.e. varṇotpatti. Based on āśrayāśrayībhāva, the derangement of pittadoṣa leads to abnormality of raktadhātu. Śrama and śoka leads udānavāta to travel in body through dhamani and get sthānasamśraya in mukhagata tvaca and causes vitiation of bhrājakapitta giving rise to discoloration of the skin. While describing about samprāpti of vyaṅga, Caraka had said that pitta vitiated by its causes when get dried in rakta of tvak vyaṅga develops.

As per the āyurveda texts, vyaṅga is a maṇḍala on face which is tanu and śyāva.[12] Suśruta and his followers gave an additional point regarding rūpa of vyaṅga. According to them vyaṅga is painless. Caraka did not specifically mention the rūpa of vyaṅga. According to Vāgbhaṭa, it appears with varying symptoms on the basis of doṣa involvement like paruṣa (roughness), paruṣasparśa (rough on touch), śyāvavarṇa (dark brown colour) due to vātadoṣa, tāmravarṇa (coppery colour), nīlavarṇa (bluish colour) due to pittadoṣa, śvetavarṇa (whitish colour) with kaṇḍu (itching sensation) due to kaphadoṣa.[13]

According to modern science, it can be correlated with melasma (facial melanosis) on the basis of signs and symptoms. Melasma is derived from the Greek word 'melas' (black) while 'chloazein' (green), and since the pigmentation is brown- black, melasma is the preferred term.[14] It is acommon, acquired and symmetrical hypermelanosis characterized by more or less dark brownish maculae, with irregular contour but clear limits, on photoexposed areas especially the face, forehead and temples and more rarely on the nose, eyelids, chin and upper lips.

The exact aetiology of melasma is unknown but several other factors include genetic predisposition, ultraviolet (UV) radiation exposure, hormonal factors such as female sex hormones and thyroid disease, pregnancy and drugs like phenytoin.[15] Among them sun exposure and genetic factors are considered the two most important etiological factors. UV rays lead to lipid peroxidation of cellular membranes resulting in free radical production and finally increased melanin production. All the wavelengths emanating from sunlight, including visible light can induce melasma.[16]

Pathogenesis

Mainly two important events are responsible for the cutaneous pigmentation; the synthesis of melanin by melanocytes and the transfer of melanosomes to surrounding keratinocytes.[17] Number of melanocytes in human skin of all types is essentially constant. But the number, size and manner in which melanosomes are distributed within keratinocytes vary. The melanin content of human melanocytes is heterogeneous not only between different skin types but also between different sites of the skin from the same individual.[18] Melanin plays a very important role in defending the body against harmful UV rays

and other environmental challenges. Minor changes in the physiological status of the human body or exposure to harmful external factors can affect pigmentation patterns either in transitory (such as in pregnancy) or permanent (e.g., age spots) manners. Basal membrane damage also plays an essential role in melasma as it leads to falling off or migration of active melanocytes and melanin into the dermis and may be responsible for the persistent hyper-pigmentation in melasma.

There are various factors that provoke melanocytes to go into overdrive and these different root causes are responsible for the different types of brown spots. Epidermal melanin deposition causes a brownish appearance and dermal melanin appears bluish. Combined epidermal and dermal melanin deposition appears grey. There is no consensus as to the clinical classification of melasma. Two patterns of facial melasma are recognized: central-facial, which affects the central region of the forehead, mouth, lips, supra labial area and chin and malar, which affects the zygomatic region. At some places a third and less frequent pattern called mandibular.[19] However, in India the malar region is more frequently involved (73%).[20] Rarely other sun-exposed areas like extensors of the forearm may be involved. Arecent classification divides melasma into transient and persistent variants depending on natural history. Lesions disappearing within a year of stopping any risk factors like oral contraceptive pills or after pregnancy is classified as transient while lesions present even after 1year of absence of any risk factors is called persistent. The persistence is due to persisting sun exposure.[16]

Treatment

Treatment of melasma is very challenging due to relapsing tendency, dermal component which is difficult to treat and emotional swings associated with the condition. Combination of hydroxyquinone with topical tretinoin and steroids are considered as first line of treatment.[16] Regular usage of sunscreens does offer some protection against relapse, but it is not absolute. So, treatment regimens must offer prolonged remission and in addition have to be safe to use for that prolonged period. It is possible only if we have proper knowledge regarding pathogenesis and symptoms of the disease. Based on this knowledge the treatment principle of the disease should be applied clinically. In āyurveda, both antaḥ-parimārjana and bahirparimārjana cikitsā are mentioned for vyaṅga. Here at first, raktamokṣaṇa is done in the affected part, then after rubbing the affected part lepa should be applied as mentioned in classics.[12a] Since vyaṅga is manifested due to vitiation of raktadhātu on the basis of āśrayāśrayī- bhāva i.e.'Pittam tu svedaraktayaḥ' it can beconcluded that there is relation between raktadhātu and the pitta doṣa. So, in pitta dominant diseases, jaḷūkāvacaraṇa[21] can be done.

Samśodhanacikitsā such as vamana, virecana and nasya can also be done in vyaṅga. Nasya is preferred for the disease of head and neck. Vyaṅga is one of the disease occurring on face and the medicine used for this purpose are mainly pitta-vātaśāmaka and raktaprasādaka and tvacānugāmi, so they counteract vitiated doṣa and bring tvaca in normal complexion. It is also useful in psychological factors of the disease as factors like krodha and śoka and śrama are responsible for vyaṅga. Prāṇavāyu is situated at head 'Sthānam prāṇasya mūrdhoraḥkaṇṭhajihvā-syanāsikā' vitiated prāṇavāyu is controlled by nasya therapy. Nasya act at śṛṅgāṭakamarma and easily distribute inside head to palliate psychological stress.

Arjunatvak lepa is helpful in management of vyaṅga, as rasa of arjunatvak is kaṣāya rasa, guṇa are laghu and rūkṣa, vīrya is śīta and is mainly having pitta śāmaka, raktaprasādaka and tvakprasādaka properties. Due to its kaṣāyarasa it pacifies pitta and raktadoṣa and removes tvakvaivarṇyatā[22] and helps to attain the normal skin colour. Due to its śītavīrya it pacifies pittadoṣa and purify accumulated doṣa due to prasādana property of śītavīrya.

Treatment according to doṣa dominance is also mentioned in Aṣṭāṅgasamgrahaḥ as in vātajavyaṅga - pāna, abhyaṅga, nāvana and pralepa. Pittajavyaṅga -abhyaṅga, nāvana, virecana, rudhirāvsecana and lepa. Kaphajavyaṅga- pāna, nāvana, abhyaṅga and pralepa. Raktajavyaṅga- sirāvisrāvaṇa, vamana and virecana.[23] As the chances of recurrence are often more after discontinuation of the treatment there is a definite need for treatment to overcome this problem. For this āyurveda line of treatments like śodhana (purification) will give better result as it will pacify the doṣa so that the chances of recurrence will be less.

Discussion

Vyaṅga is one of the unaesthetic dermatoses that lead to great demand for specialized treatment, even though it is just a common and benign pigmentation abnormality. But it causes associated emotional and psychological effects in individuals affected by this due to its cosmetically compromising nature, who often, because of dissatisfaction with their appearance, eventually reduce their social lives. As explained by ācārya in several āyurveda texts and modern literatures concerning melasma we can conclude that both sciences have shown great similarity in the understanding of melasma in terms of causative factors, onset of symptoms, age factors, patho-physiology and method of treatment of melasma. Vyaṅga has been elaborated in āyurveda as a kṣudraroga. In pathophysiological process of vyaṅga, factors stated by ācārya has given special emphasis towards psychological factors like krodha, śoka and śrama, which are commonly found in most of the patients. In samprāpti of vyaṅga, ācārya Caraka has mentioned that the aggravation of pitta along with rakta is the chief culprit for initiation of the pathology. Vyaṅga is a raktapradoṣajavyādhi. Hence, the very first affected is raktadhātu. Doṣaprakopakahetu, vitiates the agni (pittadoṣa) which resides in rasa and initiates the pathogenesis of vyaṅga.

As far as the treatment of vyaṅga is concerned, both the sciences advise the use of tropical as well as oral medications. Modern science describes the treatment as per the severity of the disease similarly āyurveda has also advised raktamokṣaṇa for severe cases of vyaṅga. Āyurveda believes in expelling the root causes of vyaṅga by giving śodhanacikitsā. Therefore, as far as the treatment of vyaṅga is concerned it is most important for the drugs to have kapha-pitta śāmaka, raktaprasādaka and varṇya properties. Modern science also aims at eliminating one of the main factors of vyaṅga by advising oral as well as local antibiotics. As the disease vyaṅga is coming under yāpyavyādhi (intake of medicine and diet can symptomatically improve the pathological condition) and treatment remedies are also minimum. Hence, it needs to pay special attention on this aesthetic sickness. In present time such kind of cosmetic problems are very common. To minimize this problem, proper diagnosis with severity of the disease is very essential.

Effective treatment modalities are available in both the sciences, but sometimes adverse effects of modern medicines limit their use. In the present review, an effort is made to compile all the scattered references of vyaṅga under one roof and also a comparison is made between āyurveda and modern medicines with regards to understanding of vyaṅga.

Vyaṅga is kṣudraroga (group of skin disorder), with various sign and symptoms like 'maṇḍalam visṛjati' (circular lesion), nīrujatanuka (painless thin lesion), śyāva (dark brown colour lesion over skin) in face. It is a pathological condition of the facial skin which is caused by vitiation of vāta and pitta and is also a raktapradoṣajavikāra.

Conclusion

Melasma is a common pigmentary disorder having deleterious impact on patient's life quality. As per āyurveda, vyaṅga is a disease mentioned under kṣudraroga. The foremost objective of āyurveda is not only to prevent the disease but also to cure the disease. Thus āyurveda not only treats the disease but it also removes the root cause.

Reference

1. Pichardo R., Vallejos Q., Feldman S. R., Schulz M. R., Verma A., Quandt S. A., et. al., The prevalence of melasma and its association with quality of life in adult male Latino migrant workers, *International Journal of Dermatology*, 48 (1), P 22- 26, 2009.

2. Werlinger K. D., Guevara I. L., GonzŚlez CM, Rinc n ET, Caetano R, Haley RW, et al., Prevalence of self- diagnosed melasma among premenopausal Latino women in Dallas and Fort Worth, Tex, *Archives of Dermatology*, 143, P 424-425, 2007.

3. Rathore S. P., Gupta S. and Gupta V., Pattern and prevalence of physiological cutaneous changes in pregnancy: a study of 2000 antenatal women, *Indian Journal of Dermatology, Venereology and Leprology*, 77, P 402, 2011.

4. Wong R. C. and Ellis C. N., Physiologic skin changes in pregnancy, *Journal of the American Acadamy of Dermatology*, 10, P 929- 940, 1984.

5. Sivayathorn A., Melasma in orientals, *Clinical Drug Investigation*, 10, P 34- 40, 1995.

6. Grimes P. E., Melasma. Etiologic and therapeutic considerations, *Archives of Dermatology*, 131, P 1453-1457, 1995.

7. Pathak MA, Fitzpatrick TB, Kraus EW. Usefulness of Retinoic acid in the treatment of melasma, *Journal of American Academy of Dermatology*, 15, P 894- 899, 1986.

8. Rook A., *Text Book of Dermatology*, Volume I, 4th Edition, Blackwell Scientific Publications, London, P 670, 1986.

9. Satoskar R. S., Bhandarkar S. B. and Ainapure S. S., *Pharmacology and PharmacoTheuraputics*, 16th Edition, Sec. XIII, P 843- 844, Popular Prakashan, Mumbai, 1999.

10. *Yogaratnakara*, Kshudrarogacikitsa, Edited by Bhishagratna Brahmashankar Shastri, 8th Edition, P 283, Chaukhamba Sanskrit Sansthan, Varanasi, 2004.

11. Susruta, *Susrutasamhita*, Cikitsasthanam 20/33, Kshudrarogacikitsa adhyayam, Edited by Kaviraj Ambikadatta Shastri, 14th Edition, Chaukhambha Sanskrit Sansthan, Varanasi, 2003.

12. Susruta, *Susrutasamhita* with Nibandhasamgraha Commentary of Shri Dalhanacarya, Edited by Vaidya Yadavji Trikamji Acharya and Narayan Ram Acharya, Nidanasthanam 13/47, Chaukhambha Orientalia, Varanasi.

12a. Ibidem., Cikitsasthanam 20/ 33-34

13. Vagbhata, *Ashtangahrdayam* with Commentaries of Arunadatta and Hemadri, Edited by Vaidya Hari Sadasiva Sastri Paradakara, Uttarasthanam 31/ 28-29, P 889, Reprint edition, Chaukhamba Sanskrit Sansthan, Varanasi, 2014.

14. Bandyopadhyaya D., Topical treatment of melasma, *Indian Journal of Dermatology*, 54, P 303- 309, 2009.

15. Rashmi Sarkar, Pooja Arora, Vijay Kumar Garg, Sidharth Sonthalia and Narendra Gokhale, Update on Melasma, *Indian Dermatology Online Journal*, Volume 5, Issue 4, October-December 2014.

16. Manas Chatterjee and Biju Vasudevan, Recent advancements in melasma, *Pigment International*, Volume 1, Issue 2, P 70- 80, July- December 2014.

17. Fitzpatrick T. B. and Szabo G. (1959) The melanocyte: cytology and cytochemistry, *The Journal of Investigative Dermatology*, 32(2 Part 2), P 197- 209.

18. Sturm R. A., Box N. F. and Ramsay M., Human pigmentation genetics: the difference is only skin deep. *Bioessays- News and Reviews in Molecular, Cellular and Developmental Biology*, 20 (9), P 712- 721, 1998.

19. Sanchez N. P., Pathak M. A., Sato S., Fitzpatrick T. B., Sanchez J. L. and Mihm Jr. M. C., Melasma: a clinical, light microscopic, ultrastructural and immunofluorescence study, *Journal of the American Academy of Dermatology*, 4(6), P 698- 710, 1981.

20. Kanwar A. J., Dhar S. and Kaur S., Treatment of melasma with potent topical Corticosteroids, *Dermatology (Basel, Switzerland)*, 188 (2): 170, 1994.

21. Susruta, *Susrutasamhita,* Edited by Shrikantha Murthi K. R., (*Illustrated Susrutasamhita*) Volume 1, P 82, Chaukhamba Orientlia, Varanasi, 2010.

22. Vagbhata, *Ashtangasangraha*, Sutrasthanam, Edited by Shrikantha Murthy K. R., Sutrasthanam 18/ 17, P 340, 9th Edition, Chaukhamba Orientalia, Varanasi, 2005.

23. Vagbhata, *Ashtangasangraha* with Hindi Commentary by Kaviraj Atrideva Gupta, Uttarasthanam 36/31, 37/ 23,25,27,28,29,31, Chaukhambha Krishnadas Academy, Varanasi.

Authors

Pretya Juyal, Post Graduate Scholar, Department of Panchakarma, Rishikul Campus, UAU, Haridwar, Uttarakhand.

Divya Aswal, Post Graduate Scholar, Department of Panchakarma, Rishikul Campus, UAU, Haridwar, Uttarakhand.

Sharma K. K., Head, Department of Panchakarma, Rishikul Campus, UAU, Haridwar, Uttarakhand.

Alok Kumar Srivastava, Professor, Main Campus, UAU, Dehradun, Uttarakhand.

Parul Sharma, Assistant Professor, Rishikul Campus, UAU, Haridwar, Uttarakhand.

CASE STUDY
Āryavaidyan, Vol. XXXIII, No. 3, February - April 2020, Pages 34 - 37

Agenesis of Palmaris longus muscle: a case study

Vijaynath V., Vishnu Ravi, Jularani P. and Seema T. S.

ABSTRACT: Palmaris longus is a slender muscle of the superficial group muscles of the anterior compartment of forearm. Agenesis of palmaris longus muscle is one of the commonest anatomical variation found in routine cadaveric dissection. In this case agenesis of palmaris longus was noticed in the anterior compartment of the left forearm whereas the muscle was present in the right forearm. The other superficial muscles of the anterior compartment of both forearms were found to have normal origin and insertion.

Key words: Palmaris longus, Superficial flexor muscles, Forearm

Introduction

The anterior compartment of the forearm contains the flexor muscles which are arranged in superficial and deep groups. Muscles of the superficial flexor compartment arise from the medial epicondyle of the humerus by a common tendon. They are pronator teres, flexor carpi radialis, palmaris longus, flexor digitorum superficialis and flexor carpi ulnaris.[1]

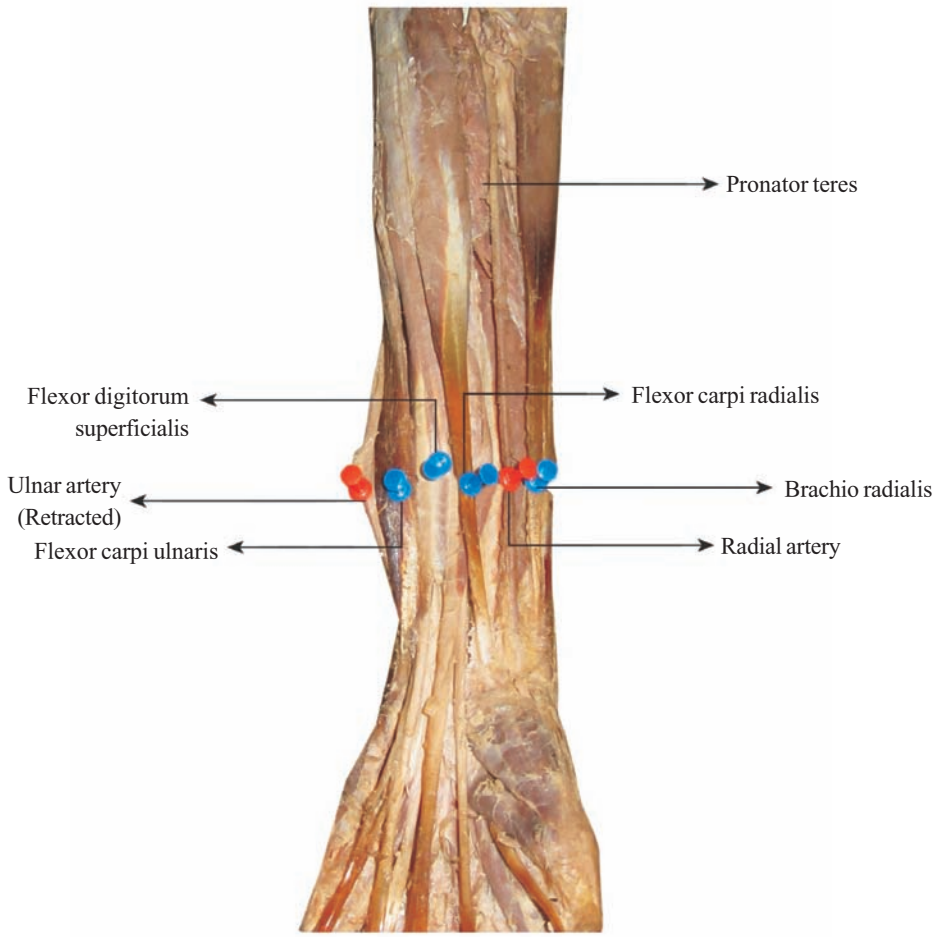
Palmaris longus is a slender, fusiform muscle medial to flexor carpi radialis. It springs from the medial epicondyle by the common tendon and from adjacent intermuscular septa and deep fascia. It converges on a long tendon, which passes anterior (superficial) to the flexor retinaculum. A few fibres leave the tendon and interweave with the transverse fibres of the retinaculum, but most of the tendon passes distally. As the tendon crosses the retinaculum it broadens out to become a flat sheet which becomes incorporated into the palmar aponeurosis. Palmaris longus is often absent on one or both sides. The median nerve at the wrist lies partly under the cover of the tendon of palmaris longus, and partly between the tendons of palmaris longus and flexor carpi radialis. The muscle belly of palmaris longus is supplied by a small branch from the anterior ulnar recurrent artery. A small contribution is sometimes made by the median artery if this is well developed. Palmaris longus is innervated by the median nerve. It has been suggested that palmaris longus is a phylogenetically degenerate metacarpophalangeal joint flexor. Although consideration of the line of action would suggest that it plays a role in carpal flexion, its main function appears to be as an anchor for the skin and fascia of the hand, in resisting horizondal shearing forces in a distal direction, (e.g. as in holding a golf club), which would tend to deglove the skin of the palm.[1a]

Though palmaris longus is said to be clinically insignificant by many authors, it is one of the most preferred muscles for tendon graft in reconstructive surgeries. A sound knowledge of the muscle is needed for a surgeon.

Case report

During routine dissection of a 62-year-old male formalin fixed cadaver for undergraduate students according to the Cunningham's manual of practical anatomy it was observed that the palmaris longus muscle was absent in the left forearm. All the other superficial muscles of the flexor compartment of the left forearm were found to have normal origin and insertion. (Figure 1). Palmaris longus muscle was present in the right forearm and all the superficial muscles of the flexor compartment of the right forearm were found to have normal origin and insertion. (Figure 2).

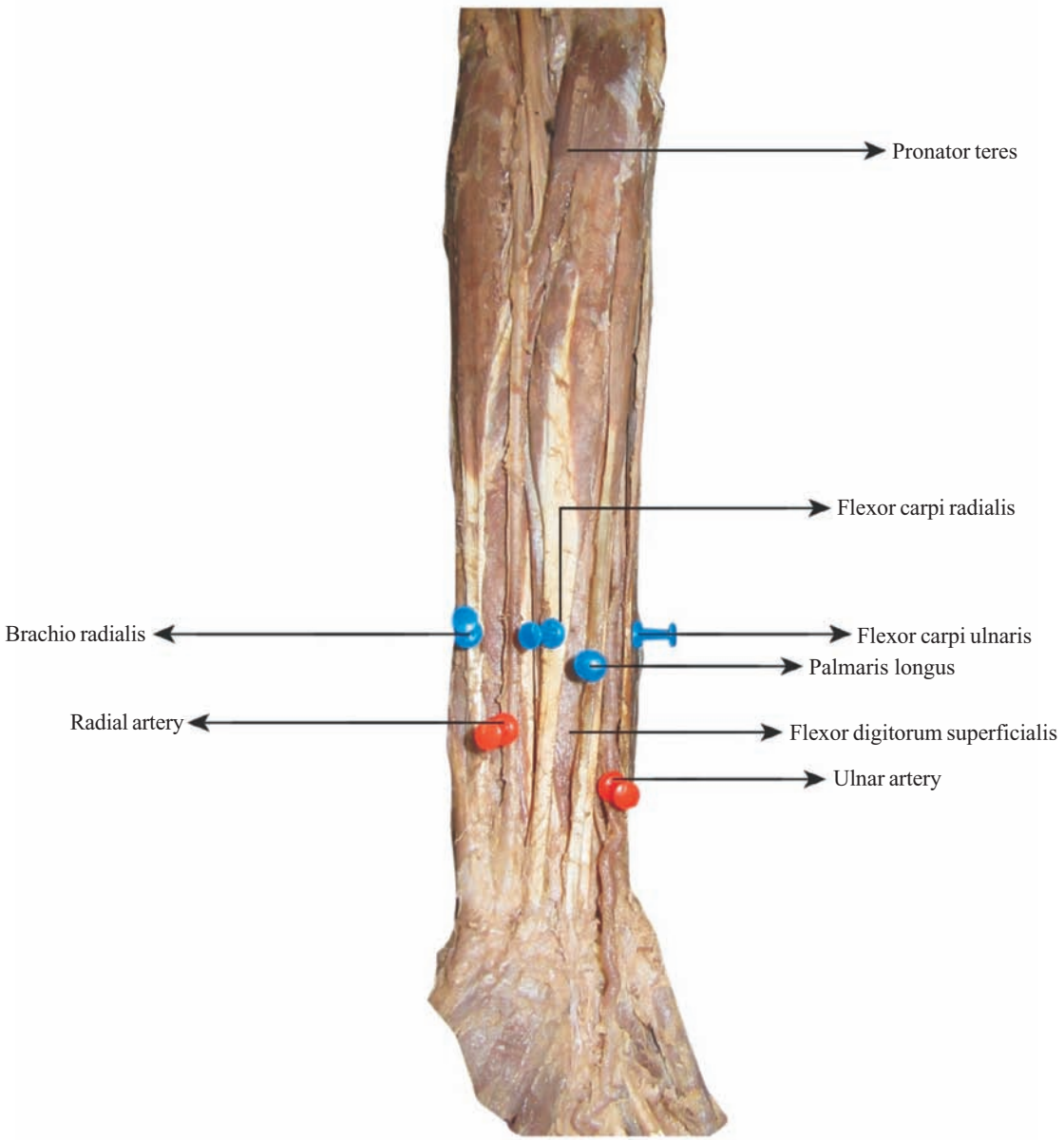
Figure 1
Left forearm



In the left forearm, the superficial flexor muscles from lateral to medial were pronator teres, flexor carpi radialis and flexor carpi ulnaris with flexor digitorum superficialis forming an intermediate layer between superficial and deep flexors. Palmaris longus was absent. The radial artery was found lateral to the flexor carpi radialis muscle and the ulnar artery was found posterior to the flexor carpi ulnaris muscle along with the ulnar nerve. The median nerve was found to lie deep to the tendon of flexor carpi radialis. All the superficial flexor muscles in the left forearm were found to be normal in size. (Figure 1).

In the right forearm superficial flexor muscles from lateral to medial were pronator teres, flexor carpi radialis, palmaris longus and flexor carpi ulnaris with flexor digitorum superficialis forming an intermediate layer between the superficial and deep flexors. All the muscles in the right forearm were found to be normal in size. The palmaris longus which originated from the medial epicondyle of the humerus was found to possess a short belly and a long tendon. Palmaris longus was inserted into the distal half of the flexor retinaculum and apex of the palmar aponeurosis. The radial artery was found to lie lateral to the flexor carpi radialis muscle. The median nerve was found to lie deep to the tendon of palmaris longus. The ulnar artery was found to emerge between the tendons of flexor carpi ulnaris and flexor digitorum superficialis muscle with the ulnar nerve lying deep to it. (Figure 2).

Figure 2
Right forearm



Discussion

Palmaris longus muscle is considered as a mere phylogenetically degenerate metacarpophalangeal flexor because of its clinical insignificance. Agenesis of palmaris longus is one of the most common anatomical variations and has been reported by a number of authors.

Brinkman R. J. et. al. report that it remains unknown whether the observation on the absence of the palmaris longus was first done by Andreas Vesalius in 1543 or Realdo Colombo in 1559.[2]

Ioannis D., et. al. in a literature review has mentioned about five methods for the clinical examination of palmaris longus muscle. They are 1) The standard test or Schaeffer's test 2) Mishra's I test 3) Mishra's II test 4) Thompson's test 5) Pushpakumar's test or 'Two finger sign' method.[3]

In a study conducted by Kapoor S. K., et. al. in 500

Indian patients, the prevalence of palmaris longus agenesis was found to be 17.2% (8% bilateral and 9.2% unilateral). The prevalence of agenesis was significantly more common on the left side. Male subjects had a greater likelihood of unilateral agenesis, while female subjects were more likely to have bilateral agenesis.[4]

A study conducted by Barkats N., in Hungarian population states that prevalence of absence of the palmaris longus was 52.92%. During the examination, unusual results appeared regarding the agenesis of palmaris longus in the elder population of village. Further tests among elder population shoved that in people born before 1945 the agenesis rate of palmaris longus was higher than 70%, and in villagers born after 1945 the agenesis rate drops by 23%.[5]

In a study conducted by Kose O. et. al. in the Turkish population,1350 randomly selected adult patients (675 men and 675 women) were clinically examined and the following results were published. The overall prevalence of the absence of palmaris longus (unilateral or bilateral) was 26.6% in the Turkish population. The absence of palmaris longus in women was statistically more common than men. The bilateral absence of palmaris longus was statistically frequent than unilateral absence. The prevalence of absence of palmaris longus was statistically similar between the body sides.[6]

Georgiev G..P. et. al. in a study of 56 human cadavers has reported the following variations. Absence (2.68%); reversed palmaris longus coexisting with an additional abductor digiti minimi muscle (0.89%); digastric (0.89%); palmaris longus with intermediate muscle belly (1.79%) and duplication (1.79%).[7]

Conclusion

The agenesis of palmaris longus is a common anatomical variation encountered during routine dissection. Profound knowledge of the structure and agenesis of this muscle is inevitable for the surgeons since this is the first choice for tendon grafts.

Reference

1. Susan Standring, *Gray's Anatomy- The Anatomical Basis of Clinical Practice*, Pectoral girdle and Upper limb, P 873, 39th Edition, © Elsevier Ltd., 2005.

1a. Ibidem., P 876- 877

2. Brinkman R. J. and Hage J. J., The first description of the absence of the palmaris longus muscle, *Journal of Plastic surgery and Hand surgery*, 50(1), P 56-58, 2016.

3. Ioannis D., Anastasios K., Konstantinos N., Lazaros K. and Georgios N., Palmaris Longus Muscle's Prevalence in Different Nations and Interesting Anatomical Variations: Review of the Literature, *Journal of Clinical Medicine Research,* 7(11), P 825-830, November 2015

4. Kapoor S. K., Tiwari A., Kumar A., Bhatia R., Tantuway V. and Kapoor S., Clinical relevance of palmaris longus agenesis: common anatomical aberration, *Anatomical Science International*, 83(1), P 45- 48, March 2008.

5.Barkats N., Change of the agenesis rate of palmaris longus muscle in an isolated village in Ukraine, *Folia Morphologica*, 74(4), P 470-474, 2015.

6.Kose O., Adanir O., Cirpar M., Kurklu M. and Komurcu M., The prevalence of absence of the palmaris longus: a study in Turkish population, *Archieves of Orthopaedic and Trauma Surgery*, 129(5), P 609-11, May 2008.

7.Georgiev G. P., Iliev A. A., Dimitrova I. N., Kotov G. N., Malinova L. G. and Landzhov B. V., Palmaris longus muscle variations: Clinical significance and Proposal of new classifications, *Folia Medica (Plovdiv)*, 1:59(3), P 289-297, September 2017.

Authors

Vijaynath V., Assistant Professor, Department of Rachanashareera, Government Ayurveda College, Tripunithura, Kerala.
Vishnu Ravi, Assistant Professor, Department of Rachanashareera, Government Ayurveda College, Tripunithura, Kerala.
Jularani P., Associate Professor, Department of Rachanashareera, Government Ayurveda College, Tripunithura, Kerala.
Seema T. S., Professor and Head, Department of Rachanashareera, Government Ayurveda College, Tripunithura, Kerala.

OBSERVATIONAL STUDY

Āryavaidyan, Vol. XXXIII, No. 3, February - April 2020, Pages 38 - 40

An observational study to assess the Migraine disability in patients of Pariyaram Government Ayurveda College

Reshma M. A. and Anandalakshmy K. N.

ABSTRACT: Migraine is a common disabling primary headache disorder. Migraine patients are often faced with difficulty in managing the impact of disease onthe quality of their lives and their emotions. Functional disability associated with migraine can lead to physical, psychological and social consequences. 75 migraine patients, irrespective of sex and age between 20- 60 years were consecutively selected from the OPD and IPD of the Government Ayurveda College Hospital, Pariyaram before āyurveda intervention. After the initial screening process using the inclusion and exclusion criteria, details of migraine were collected by specially prepared proforma which includes assessment of prodrome, aura, headache, postdrome, triggers etc. Then their disability was assessed by using MIDAS test. Descriptive statistical analysis was done by using SPSS. Majority of the patients participated in the study were having moderate disability.

Key words: Migraine, Migraine disability

Introduction

Migraine is a common disabling primary headache disorder. It is a chronic disorder characterised by episodic attacks. It is more common in females (3:1) and is worse between the age of 20- 50 but usually improves with age. It tends to run in families. Migraine has two major subtypes.

1. Migraine without aura

2. Migraine with aura

The ratio of classic and common migraine is 1:5. Epidemiological studies have documented its high prevalence and high socio- economic and personal impacts.[1] Once migraine is diagnosed, the next important aspect is to assess the severity and degree of disability.[2] Migraine patients are often faced with difficulty in managing the impact of disease on the quality of their lives and their emotions.[3]

Materials and methods

Patients suffering from headache, irrespective of sex and aged between 20- 60 years were primarily selected from the new cases reporting in the screening OPD of the Government Ayurveda College Hospital, Pariyaram. After their consultation with a Salakyatantra expert, only those patients diagnosed with migraine headache were selected consecutively. Patients suffering from other types of primary headache disorders, secondary headache disorder, painful cranial neuropathies and other facial pains were excluded from the study. After this initial screening process, the selected patients were verbally informed about the basic details of the study. 75 consenting patients were asked to complete the written informed consent form in their regional language. After obtaining the written consent, preliminary data was collected. Details of migraine were collected by specially prepared proforma which includes assessment of prodrome, aura, associated symptoms, postdrome, etc. Assessment of aura was done by using visual aura rating scale[4] (VARS). This scale is comprised of five major symptoms that are individually weighed and is helpful for the diagnosis of migraine with aura. Table 1.

Then their disability was assessed by using MIDAS test.[5] MIDAS is a short self- administered and 7- item questionnaire to quantify headache- related disability in a span of three months. Among these seven questions, only the first five questions are scored. The last two questions assess the total days and the pain

Table 1 Visual aura rating scale	
Visual symptom	Risk score
Duration (5-60 minutes)	3
Gradual development > 5 minutes	2
Presence of scotoma	2
Presence of zig- zag lines	2
Unilateral location	1
Migraine with aura diagnosis	> 5

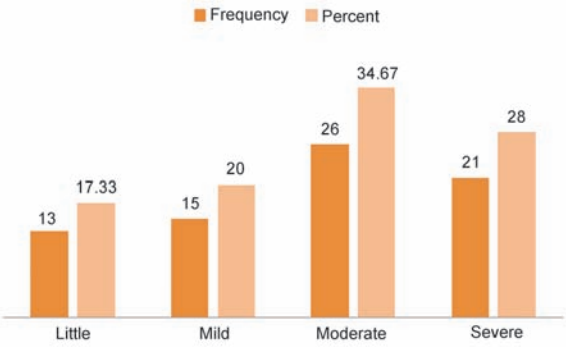
suffered by the subject due to headache. This questionnaire measures the influence of headaches on three domains of activity (work, household work, and non- work activities) over the preceding three months. After that total score was obtained by totalling the number of days. Finally the patient was then assigned to one of the following four levels of disability. Table 2.

Table 2 Grades of Migraine disability		
Grade	Disability	Score
I	Little or no disability	0-5
II	Mild	6- 10
III	Moderate	11- 20
IV	Severe	21+

Observations

Following were the descriptive statistical analysis of the sample. Table 3 and Figure 1.

Figure 1
Distribution of Migraine disability



In this study migraine was found to be common in the age group of 31-40 years. 85% of the subjects were females and 15% were males. When the prodromal symptoms were analysed, sensitivity to light, smell or noise was the most common one.

Table 3 Observations		
		Percentage
Age	21- 30 years	25.33
	31- 40 years	34.67
	41- 50 years	22.67
	51-60 years	17.33
Prodromal symptoms	Altered mood	26.7
	Irritability	38.7
	Depression	8
	Euphoria	0
	Fatigue	42.7
	Craving for certain food	2.7
	Stiff muscles	24
	Constipation	12
	Diarrhoea	6.7
	Sensitivity to light, smells or noise	69.3
	Difficulty in concentrating	28
	Yawning	34.7
VARS scale	Migraine without aura	93
	Migraine with aura	7
Associated symptoms	Nausea	82.7
	Vomiting	52
	Intolerance to light	84
	Sensitivity to movement	61.3
	Speech difficulties	40
Postdrome symptoms	Sore feeling in the area where- migraine was	16
	Impaired thinking for a few days	10.7
	Feeling of tiredness	70.7
	Head pain	5.3
	Cognitive difficulties	10.7
	Gastrointestinal symptoms	30.7
	Mood changes	12
	Feel unusually refreshed	22.7
	Depression	1.3
	Malaise	30.7
Migraine disability	Little	17.33
	Mild	20
	Moderate	34.67
	Severe	28

According to VARS scale most of the participants were suffering from migraine without aura. Intolerance to light and noise was the most frequent associated symptom. The most common postdrome symptom reported was feeling of tiredness. Most of the participants in this study had moderate degree of migraine disability.

Discussion

The prevalence of migraine varies considerably with age and its highest prevalence was usually seen

between the ages 30 and 39 years.[6] Lifetime prevalence of migraine is increased in females compared to males, with a female: male ratio ranging from 2:1 to 4:1 in several populations. Several hypotheses have been raised for this female predominance such as neurobiological factors, increased sensitivity to environmental stressors, etc.[7]

Prodromal symptoms may not be recognised by the patient as part of the attack and are probably the most neglected aspect of migraine. Prevalence rates of premonitory symptoms vary, likely reflecting the different methodologies used to identify these symptoms. This variability in symptomatology occurs not only in different patients but also in two attacks of the same patient with migraine.[8]

VARS scale for migraine quantifies the important cardinal characteristics of migraine with aura. Sometimes migraine with aura patients also has attacks of migraine without aura. Intolerance to light and noise was the most frequent associated symptom. These symptoms also vary among patients. These accompanying symptoms increase the disability of the patient and are occasionally more troublesome for the patient.

Postdrome symptoms were common in the study subjects and also contributedmuch to their distress and disability. The postdrome, while disabling for many patients has not been prospectively documented, and is not defined in the ICHD. Descriptive data on postdromal features shed light on their mechanisms and offer novel approaches to treating and terminating headaches.

Among 75 migraine patients, 34.67% were having moderate disability ie. the study subjects had lost about eleven to twenty days of recent three months due to migraine. Migraine affected their work, household work or non- work activities which reduced their productivity much. 28% had severe disability ie. above twenty days were lost. It contributes extensively to the disease related burden and resulting in lowered quality of life.

Conclusion

Migraine is a common disabling primary headache disorder with high personal and social costs. It ranges in severity, with mild headache and no disability on one extreme and excruciating pain and complete disability on the other. Because of this spectrum of severity, diagnosis alone does not provide enough information to permit the selection of optimal therapy. So it is essential to understand the symptoms and the disability of the patient very well.

Reference

1. Headache Classification Committee of the International Head ache Society, The international classification of headache disorders, 33(9), P 644- 655, 3rd Edition (Beta version), *Cephalalgia*, 2013.

2. Jupitor Chakma, *How to assess the severity of your migraine headache*? [Internet] July8, 2011[cited 2017 April 15]. Available from: http://www.ichd-3.org/1-migraine/ .

3. Herbert L. B., *The real impact of migraines on quality of life*, data from the 2015 migraine in America survey [internet]. 2015 September 24. [Cited 2017 May 1].Available from: http://www.migraine.com .

4. Eriksen M. K. et. al., The visual aura rating scale(VARS) for migraine aura diagnosis, *Cephalalgia*, [internet], October 2005. [cited on 2018 January]. Available from: https://pubmed.ncbi.nlm.nih.gov

5. Dan Longo L., Dennis Kasper L., Larry Jameson J., et. al., *Harrison's Principles of Internal Medicine*, Part 2, P 114- 119, 18th Edition.

6. Bigam M. E., et al., , Age dependent prevalence and clinical features of migraine, *Neurology*, 2006. [Internet]. Available from: www.ncbi.nlm.nih.gov/m/pubmed

7. Carolina Lemos, Isabel Alonso, Alda Sousa, et. al., Assessing risk factors for migraine: differences in gender transmission, *PLoS One*, Published online. [Internet]. 2012 November 21. Available from: www.ncbi.nlm.nih.gov/m/pubmed.

8. Panagiota Voskou and Anastasia Bougea, Aura and important prodrome symptoms of migraine: a study in a Greek population, *EMJ European Medical Journal*, [Internet]. 7 August 2018. Available from: https://www,emjreviews.com.

Authors

Reshma M. A., Post Graduate Scholar, Department of Kriyasareera, Government Ayurveda College, Pariyaram, Kannur, Kerala.

Anandalakshmy K. N., Professor and Head, Department of Kriyasareera, Government Ayurveda College, Pariyaram, Kannur, Kerala.

EVALUATIVE STUDY

Āryavaidyan, Vol. XXXIII, No. 3, February - April 2020, Pages 41 - 47

A clinical evaluation of synergestic effectiveness of āhāra and vihāra in management of Sthaulya

Aparajita Das and Tapas Brata Tripathy

ABSTRACT: Sthaulya, a health related condition known as obesity, is caused by a combination of unhealthy food habits, sedentary life styles and genetic susceptibility. It is a major health care challenge in the present era. Though it has a hereditary cause, manipulation of diet and lifestyle can keep it at bay. Āyurveda with its holistic approach can help in this condition with its unique way of lifestyle and dietary manipulation. This study was done to evaluate the effectiveness of āhāra and vihāra in the management of sthaulya. In this study, 60 cases diagnosed as sthoulya were suggested a modified āhāra and vihāra for 07 days after admitting them in hospital. This included mudgayūṣa, yavaroṭika, āmalakī and eraṇḍakarkaṭī as diet. Vyāyāma, udvartana, followed by pariṣeka (daśamūlakaṣāya) based on āyurveda principles. Anthropometry and serum lipid profile were done before and after treatment. These āhāra and vihāra were more effective in reducing all the anthropometrical parameters of sthaulya. Reduction in total cholesterol, triglycerides, LDL and VLDL was significant for all patients. Most of the subjective parameters showed better relief. Among which, the effect on pacifying hunger was statistically significant. The synergestic efficacy of āhāra and vihāra were concluded based on the statistical data and was found to be beneficial in reducing weight and maintaining the overall health status. On assessing the results obtained from this study it was found that this can be practiced in people for improving the quality of life.

Key words: Āyurveda, Sthaulya, Obesity, Āhāra, Udvartana, Vyāyāma

Introduction

In recent times prevalence of chronic non communicable disease is increasing among young population due to changes in food habits and sedentary lifestyle. Obesity is one among such lifestyle disorder and it is associated with increased morbidity and mortality. The prevalence of obesity has tripled worldwide since 1975. In 2016 more than 1.9 billion adults aged 18 and older were overweight, of which over 650 million were obese. This represent about 39% of adults with overweight and 13% of them obese.[1] Considering the disease burden in India, according to National Family Health Survey 2007 it was estimated that 12.1% of males and 16% of females were overweight or obese and in Karnataka it was 14% of males and 17.3% of females.[2] Obesity is a medical condition in which excess body fat gets accumulated in the body. It is most commonly caused by a combination of excessive food intake, lack of physical activity and genetic susceptibility.[3] Some cases are also caused by endocrine disorders, medications or mental illness.[4] The chronic nature of this condition makes the food, lifestyle equally important in the management of obesity. Obesity increase the other diseases like type 2 diabetes mellitus, heart disease, certain type of cancer, obstructive sleep apnea and osteo arthritis.[5] In āyurveda, obesity is explained in terms of sthaulya. It is also known as atisthoulya by ācārya Caraka. It is one among the eight types of ninditapuruṣa.[6] Improper diet and lifestyle are equally important in causation of this condition. Mostly food (āhāra) is taken into consideration of etiological factor, but lifestyle (vihāra) also plays an important role. Many vihāra have been mentioned in classics as the cause of sthaulya. They are lack of physical activity, lack of sexual involvement, day sleep, luxurious sitting, etc. Sthūla are sadātura, so they need regular management. Here through a clinical study, specific food and lifestyle modification are advised for management of obesity.

Materials and methods

Source of data: Patients attending the Out-patient department and In-patient department of Swasthavritta, Sri Dharmasthala Manjunatheswara College of Ayurveda and Hospital, Hassan, Karnataka.

Study group: A total of 60 patients fulfilling the diagnostic and inclusion criteria were selected by convenient sampling method and treated in a single group.

Study design: Convenient sampling method, open label single arm, pre and post design.

Sampling technique: Convenience sampling

Ethical clearance for the study has been obtained from Institutional ethics committee of SDM college of Ayurveda and Hospital, Hassan (SDM/IEC/83/2017-2018). The study was also registered in Clinical trials registry of India (CTRI/2017/08/015209).

Method of collection of data

Screening: A screening performa was prepared with all aspects of history, signs and symptoms of sthaulya and laboratory investigations to rule out major illness. During this process, patients were thoroughly screened for signs and symptoms of sthaulya.

Diagnostic criteria: Patients were diagnosed as per symptoms of obesity. Diagnosis was made depending on the anthropometry measurement and clinical symptoms like weight gain, protrusion of abdomen, body pain, dyspnoea, etc.

Inclusion criteria

- Patients age of 20-40years
- Diagnosed case of sthaulya
- Over weight, Body mass index(BMI) is greater than 25 kg/m^2 upto 34kg/m^2

Exclusion criteria

- Obesity due to other disorders like PCOS, diabetes mellitus, hypertension, hypothyroidism, etc.

Assessment criteria

Assessment was made based on primary outcome parameters and secondary outcome parameters, which are as follows:

Primary parameters

- Weight
- Body Mass Index
- Circumference of chest, abdomen, waist, hip, mid arm, mid thigh and waist hip ratio.
- Chest circumference was measured at the level of nipples.
- Abdominal circumference was measured at the midpoint of the line between the costal margin and the iliac crest in the midaxillary line.
- Waist circumference was located the narrowest point between ribs and iliac crests.
- Hip circumference was located the greater trochanter, measurement was taken at the widest lateral extension of the hips.
- Mid-arm circumference was measured by standing behind the subjects, located at the lateral tip of the acromion and the most distal point on the olecranon process, a tape was placed and measurement was taken in between these two landmarks and marked the midpoint. Tape was placed perpendicular to the long axis of the arm at the marked point and measured the circumference.
- Mid-thigh circumference was taken at the level of midpoint on the lateral surface of the thigh, midway between the trochanterion and tibiale laterale.
- Waist hip ratio was calculated as waist measurement divided by hip measurement

Secondary parameters: Various features of obesity had been considered and grading was given to analyze the results statistically as follows. Table 1.

Laboratory investigation: Lipid profile was done before and after study period.

Follow up: Follow up was done after 7 days of completion of study.

Intervention

1. Patients were advised to take sarvāṅga udvartana and sargvāṅga pariṣeka with daśamūlakvātha from day one.

2. Diet and exercise as per schedule. Table 2 and 3.

Table 1 Grades for subjective parameters
1. Anutsāha
0 Unimpaired utsāha
1 Anutsāha but do not hamper routine work
2 Anutsāha which hampers routine work
3 Anutsāha which restricts routine work
2. Sveda ādhikyatā (Excess sweating)
0 No sweating
1 Sweating after moderate work
2 Sweating after mild work
3 Sweating even in resting condition
3. Kṣudraśvāsa (Dyspnoea on exertion)
0 Absent
1 Dyspnoea on moderate work
2 Dyspnoea on mild work
3 Dyspnoea even at rest
4. Atinidra (excessive sleep)
0 Sleep of 6-7 hours per day
1 Sleep of 8 hours per day
2 Sleep of 10 hours per day
3 Sleep of more than 10 hours per day
5. Athikṣudhā (excessive hunger)
0 Feels hunger at next annakāla only
1 Feels hunger for once in between annakāla
2 Feels hunger for more than twice in between annakāla
3 Feels hunger always
3 Takes food always upto full satiety
6. Ati pipāsa (excessive thirst)
0 Normal thirst
1 Up to one litre excess intake of water/fluids
2 Up to two -three litre excess intake of fluids
3 More than three litre excess intake of fluids
3 Cannot even do mild exercise
7. Aṅgagaurava (Feeling of heaviness)
0 No heaviness in body
1 Feels heaviness but it doesn't hampers routine work
2 Feels heaviness which hampers routine work
3 Feels heaviness which restricts routine work
8. Aṅgaśithilatā (Flabbiness of body)
0 No flabbiness in body
1 Flabbiness in one anatomical region
2 Flabbiness in more than one region
3 Generalized flabbiness in body
9. Gātrasāda (Fatigue)
0 No fatigue
1 Can perform work little fatigue
2 Can perform work moderate fatigue
3 Can't perform any work

Result

There was significant reduction in anthropometric parameters and lipid profile except HDL. Table 4, 5.

Table 2 Diet chart		
Time	Food Item	Quantity
6:30am	Amla juice	20ml+100ml water
9-9:30am	Mudgayūṣa	200 ml
1:00pm	Yava roṭika+palya	2 roṭika (60gms)+ 250 grams palya
5:00pm	Papaya juice	200ml
6:30pm	Amla juice	20 ml + 100 ml water
8:30pm	Yava roṭika+palya	2 roṭika (60grms)+ 250 grams palya

All the anthropometric parameters were highly significant in reduction. The mean weight of patients in the present study before intervention was 90.27 kg which reduced to 87.19kg after intervention. The results were highly significant with a P value 0.000. The mean BMI of patients in the present study before intervention was 33.34 kg/m^2 which reduced to 32.39 kg/m^2 after intervention. The results were highly significant with a P value 0.000. Chest circumference of patients showed considerable reduction from 104.53cm to 101.26 cm after intervention, which was statistically significant with P value 0.002. Abdominal circumference of patients showed considerable reduction from 106.80 cm before intervention to 110.51 cm after intervention which was statistically highly significant with P value 0.000. Waist circumference of patients showed considerable reduction from 112.53 cm to 109.98 cm after intervention, which was statistically significant with P value 0.000. Hip circumference of patients showed considerable reduction from 117.12cm before intervention to 109.98 cm after intervention which was statistically highly significant with P value 0.000. The results in Waist -Hip ratio was significant with a P value 0.000. The mean value before intervention was 0.9557 which reduced to 0.9405 after intervention, which is significant with P value 0.000. Mid arm circumference (Rt.) of patients showed considerable reduction from 35.49cm before intervention to 34.35 cm after intervention which was statistically highly significant with P value 0.000. Mid arm circumference (Lt.) of patients showed considerable reduction from 35.92cm before intervention to 34.33cm after intervention which was statistically highly significant with P value 0.003.

Table 3
Schedule of exercise

Body parts	Type of Vyāyāma	Duration
Head and neck rotation	Clockwise and anticlockwise rotation	10 counts, daily 2 times
Elbow	Flexion and extension	10 counts, daily 2 times
Wrist	Clockwise and anticlockwise rotation	10 counts, daily 2 times
Fingers	Flexion and extension	10 counts, daily 2 times
Hip joint/ abdomen	Clockwise and anticlockwise rotation	10 counts, daily 2 times
Knee	Clockwise and anticlockwise rotation	10 counts, daily 2 times
Ankle	Clockwise and anticlockwise rotation	10 counts, daily 2 times
Leg	Flexion and extension	10 counts, daily 2 times
Whole body	Walking	1 hour, morning and evening
Whole body	Cycling	1 hour, morning and evening

Table 4
Changes in anthropometry measurement (paired t test)

Parameters	Mean		Diff. Mean	SD	SE	T	P	Remark
	BT	AT						
Weight	90.27	87.19	3.083	1.280	.166	18.654	.000	S*
BMI(kg/m2)	33.34	32.39	.951	.841	.109	8.760	.000	S*
CC	104.53	101.26	3.262	7.588	.980	3.330	.002	S*
AC	110.51	106.80	3.708	3.938	.508	7.293	.000	S*
WC	112.53	109.98	2.550	3.028	.391	6.524	.000	S*
HC	117.12	115.33	1.783	2.330	.301	5.930	.000	S*
W/H ratio	.9557	.9406	.0151	.0248	.00321	4.700	.000	S*
MAC (Rt.)	35.49	34.35	1.143	1.326	.171	6.681	.000	S*
MAC(Lt.)	35.92	34.33	1.597	3.941	.509	3.139	.003	S*
MTC(Rt.)	55.46	54.08	1.378	1.261	.163	8.467	.000	S*
MTC (Lt.)	55.43	54.05	1.375	1.210	.156	8.806	.000	S*

BMI: Body mass index, CC: Chest circumference, AC: Abdominal circumference, WC: Waist circumference, HC: Hip circumference, W/H ratio: Waist /hip ratio, MAC: Mid arm circumference, MTC: Mid thigh circumference, S: Significant ($p<0.05$).

Table 5
Changes in Lipid Profile (Paired t test)

Parameters	Mean		Diff. Mean	SD	SE	T	P	Remark
	BT	AT						
Total cholesterol	194.32	183.02	11.295	11.038	1.425	7.926	.000	S*
Triglycerides	190.13	162.06	28.068	54.811	7.076	3.967	.000	S*
HDL	49.28	51.16	-1.880	8.69	1.055	-1.783	.080	NS
LDL	106.36	100.78	5.582	21.220	2.739	2.037	.046	S*
VLDL	38.18	32.26	5.915	10.879	1.404	4.212	.000	S*

HDL: High density lipoprotein, LDL: Low density lipoprotein, VLDL: Very low density lipoprotein, S: significant($p<0.05$), NS: Non significant.

Mid thigh circumference (Rt.) of patients showed considerable reduction from 55.46cm before intervention to 54.08 cm after intervention which was statistically highly significant with P value 0.000. Mid thigh circumference (Lt.) of patients showed considerable reduction from 55.43cm before intervention to 54.05cm after intervention which was highly significant with P value 0.000.

The mean total cholesterol of patients in the present study before intervention was 194.32mg/dl which reduced to 183.02 mg/dl after intervention. The result was highly significant with P value <0.05. The mean triglyceride of patients in the present study before intervention was 190.13mg/dl which reduced to 162.06 mg/dl after intervention. The result was highly significant with P value <0.05.The mean HDL

of patients in the present study before intervention was 49.28 mg/dl which increased to 51.16mg/dl after intervention. The result was not significant with P value >0.05. The mean LDL of patients in the present study before intervention was 106.36mg/dl which reduced to 100.78 mg/dl after intervention. The result was highly significant with P value <0.05.

The mean VLDL of patients in the present study before intervention was 38.18 mg/dl which reduced to 32.26 mg/dl after intervention. The result was highly significant with P value <0.05.

Table 6 is showing the effects on subjective parameters (Wilcoxon singed rank test).

Table 6
Effects on Subjective parameters (Wilcoxon singed rank test)

Parameters	Negative ranks			Positive ranks			Ties	Total	Z	P	Remark
	N	MR	SR	N	MR	SR					
Anutsāha	22	11.50	253.0	0	00	00	38	60	-4.690	.000	S*
Svedādhikya	10	5.50	55	0	00	00	50	60	-3.162	.002	S*
Kṣudrasvāsa	11	6.00	66	0	00	00	49	60	-3.317	.001	S*
Atinidrā	10	5.50	55	0	00	00	50	60	-3.162	.002	S*
Atikṣudhā	21	11.0	231.0	0	00	00	39	60	-4.583	.000	S*
Ati pipāsā	6	3.50	21.0	0	00	00	54	60	-2.333	.020	S*
Aṅgagaurava	42	22.01	924.50	1	21.50	21.50	17	60	-6.193	.000	S*
Aṅgaśithilatā	8	5.63	45.00	2	5.00	10.0	50	60	-1.941	.052	S*
Gātrasāda	23	12.50	287.50	1	12.05	12.50	36	60	-4.491	.000	S*

Wilcoxon signed rank test showed reduction in anutsāha between BT and AT was found in 22patients and no change in 38 patients which is significant (Z-4.690, P< 0.05).

Reduction in atisveda between BT and AT was found in 10 patients and no change in 50 patients which is significant. (Z-3.162, P< 0.05).

Reduction in kṣudraśvāsa between BT and AT was found in 11 patients and no change in 49 patients which is significant. (Z-3.317, P< 0.05).

Reduction in atinidrā between BT and AT was found in 10 patients and no change in 50 patients which is significant. (Z-3.162, P< 0.05).

Reduction in atikṣudhā between BT and AT was found in 21 patients and no change in 39 patients which is significant. (Z-4.583, P< 0.05).

Reduction in ati pipāsā between BT and AT was found in 6 patients and no change in 54 patients which is significant. (Z-2.333, P< 0.05).

Reduction in feeling of heaviness between BT and AT was found in 42 patients and no change in 17 patients which is significant. (Z-6.193, P< 0.05).

Reduction in flabbiness of the body between BT and AT was found in 8 patients and no change in 50 patients which is significant. (Z-1.941, P< 0.05).

Reduction in fatigue between BT and AT was found in 23 patients and no change in 36 patients which is significant. (Z-4.491, P< 0.05)

Discussion

As per the line of management of sthaulya, the recommend diet should be guru (heavy to digest) and apatarpaṇa (non-nourishing). By the guruguṇa of āhāra, it reduces the vitiated vātadoṣa and agni. Guru āhāra takes more time to digestion. The apatarpaṇa guṇa is mainly seen in rūkṣaguṇapradhāna āhāra which will help in the reduction of medodhātu. The kaṭu, tikta and kaṣāya rasa are apatarpaṇa in nature[7,8,9] and vṛddhakaphadoṣa is treated by kaṭu, tikta and kaṣāya rasa. Analysis of āhāra in rasa clearly indicates that tiktarasa being laghu and rūkṣaguṇa reduce vitiation of kapha and medoduṣṭi and dries up the kḷeda.[9] Kaṭurasa exerts similar effects on kḷeda, kapha and medoduṣṭi by its laghu, uṣṇa and rūkṣa guṇa.[9a] Kaṣāyarasa being most rūkṣa mitigates the kaphadoṣa and dries up the kḷeda and medodhātu.[9b]

Kaṣāyarasayukta āhāra is guru in nature, which are not easily digestible.[9b] Mudgayūṣa is kaphapittahara in nature.[10] Madhurarasa and śītavīrya helps in reliving atitṛṣṇā. With the help of its properties like rūkṣa, it does rūkṣaṇa and śoṣaṇa of dhātu and rūkṣa guṇa also does śoṣaṇa which helps in srotośodhana and also reducing the medodhātu. Mudga has kaṣāya rasa which helps in reducing the obstruction of srotas. The rūkṣaguṇa, kaṣāyarasa and grāhi property of mudga mainly concerned with the medodhātuśoṣaṇa. Yava having the properties of rūkṣa, guru and madhura guṇa which act as medohara and kaphahara.[7a, 8a] The śītavīrya of yava causes satiation by balancing agni. It increases the quantity of faecal matter by elimination of excess fat. Yava is balakāraka and kaphaśāmaka while yavaroṭika is viśada, meda-pitta praśamana and can be suggested in diseases arising out of oxidative stress like sthaulya. Āmlakī having the pañcarasa *viz* amḷa, madhura, kaṣāya, tikta and kaṭurasa and śīta, rūkṣa and laghuguṇa. It is causing dryness by its rūkṣaguṇa.[11] The tikta-kaṣāya rasa dries up the moisture as well as pacifies both kapha and pitta. Though it mainly acts on pitta and kapha, it is considered to pacify all three doṣa.[12] Vāta doṣa by its amḷarasa; pittadoṣa by madhurarasa and śītaguṇa; kaphadoṣa by kaṣāyarasa and rūkṣa guṇa.[13]It also acts as svedahara[14] and medohara.[15] Āmlakī is the best fruit among all the fruits as per ācārya Suśruta. This fruit can be consumed any time in relation to food without the fear for vitiation of doṣa. The ill effects of dyslipidemia (increased oxidative stress) are prevented by the vayasthāpana action of āmlakī. Eraṇḍakarkaṭī has tiktarasa which specify the pittadoṣa and rūkṣaguṇa produces rūkṣatā to the body. It acts as kapha-vātaghna and pittaśāmaka.[16] Udvartana is mentioned as daily regimen in āyurveda. It is having the guṇa of kapha and medo vilayana. Udvartana dravya are having the qualities like rūkṣa, uṣṇa and tīkṣṇa properties. These qualities provoke kapha and medo vilayana. The combined effect of drugs and friction of the massage are responsible for the medodhātuvilayana. Rubbing of drugs leads to increase in local temperature due to which dilatation of sirā and sirāmukhaviśodhana occurs. Tvakgata agni gets stimulated and it leads to absorption and digestion of the drug and further pravilayana of medodhātu below skin may occur.

After udvartana and pariṣeka will further make pāka of kapha and medodhātu. Svedakarma rectifies the function of medodhātvagni and fastens the pāka-karma which causes srotomukhaśodhana. Pariṣeka makes svedapravartana and due to svedakarma, after udvartana it acts as sthambhana and gauravaghna. In classics vyāyāma is indicated for the management of group of various diseases termed as santarpaṇajanya roga and sthaulya is one of the santarpaṇajanya vyādhi.[7b, 8b] Regular physical activities or exercise is advised to overcome the obesity because exercise works on fat metabolism. During exercise triglyceride from adipose tissue can be broken down to glycerol and free fatty acids (FFA) and FFA can be mobilized by binding to plasma albumin for transportation in the circulation to skeletal muscle and other tissues. Intramuscular triglyceride can also be broken down to glycerol and fatty acids, which enter the mitochondria for oxidation during exercise.[17] When excess energy is consumed, the surplus is stored in adipose tissue. In addition, low levels of physical activity creates a positive excess of energy exacerbating the imbalance causing an increase in storage of body fat.[18] Excess body fat can alter physiologic function to include decreased insulin sensitivity with rising fasting insulin levels and increased cholesterol synthesis.[19] So exercise helps to decrease body fat and control obesity. In āyurveda vyāyāma is also recommended as apatarpaṇa therapy.[7c,8c]

Conclusion

Āhāra and vihāra were found to be effective in reducing all the anthropometrical parameters of the obesity up to the level of statistical significance. Among which HDL is not significant. Subjective parameters were also improved. Hence, both āhāra and vihāra can be adopted as treatment modalities for the management of sthaulya.

Acknowledgement

Authors are highly grateful to all subjects who participated in this trial. Authors thank the Institutional research committee of SDM College of Ayurveda and Hospital, Hassan, which provided necessary guidelines and facilities for conducting the research work. The constant support of staff and scholars of Swasthavritta department, SDM College of Ayurveda and Hospital, Hassan, are acknowledged with thanks.

Reference

1. World Health Organization [internet]. [cited 12 September 2018]. Available from : http:/www.who.int/news-room/fact-sheets/detail/obesity-and-overweight.

2. Medpulse [internet].[cited 8 September 2018], Available from: http://www.medpulse.in/community medicine/article/vol7 issue1/CM_7_1_2.pdf

3. Wikipedia [internet].[cited 12 September], Available from: https://en.wikipedia.org/wiki/obesity.

4. Bleich S., Cutler D., Murray C. and Adams A., Why is the developed world obese? *Annual Review of Public Health* (Research support), 29, P 273-295, 2008.

5. Haslam D. W. and James W. P., Obesity, *Lancet* (review), 366(9492), P 1197-1209, 2005.

6. Agnivesa, *Carakasamhita*, Elaborated by Caraka and Drdhabala, Ayurvedadipika Commentary of Cakrapanidatta, Edited by Jadavji Trikamji Acharya, P 117, 9th Edition, Chaukhamba Prakashan, Varanasi, 2011.

7. Agnivesa, *Carakasamhita*, with Vidyotini Hindi Commentary by Shastri K. and Chaturvedi G. N., Sutrasthanam 22/ 29, Reprint edition, Chaukambha Bharati Acadami, Varanasi.

7a. Ibidem., Sutrasthanam 27/20

7b. Ibidem., Sutrasthanam 23/ 25- 27

7c. Ibidem., Sutrasthanam 23/ 25

8. Agnivesa, *Carakasamhita,* Savimarsa- Vidyotini Hindi Commentary by Shastri R., Upadhyaya Y., Pandeya G. S., Gupta B. and Misra B., Volume 1, P 430, Choukhambha Bharati Academy, Varanasi, 2014.

8a. Ibidem., Volume 1, P 529

8b. Ibidem., Volume 1, P 436

8c. Ibidem., Volume 1, P 424

9. Vagbhata, *Ashtangahrdayam*, Nirmala Hindi Commentary by Tripathy B., Sutrasthanam 10/15, P 154, Reprint edition, Choukhamba Sanskrit Pratishthan, New Delhi, 2003.

9a. Ibidem., Sutrasthanam 10/17, P 154

9b. Ibidem., Sutrasthanam 10/20, P 154

10. *Yogaratnakara*, Edited by Kumari A. and Tewari P., Mouliksiddhanta adhyaya, Verse 380, P 50, Chaukhambha Bharati Academy, Varanasi, 2010.

11. Agnivesa, *Carakasamhita*, Edited by Acharya Y. T., Sutrasthanam 27/147, P 161, Chaukhamba Sanskrit Sansthan, Varanasi, 2001.

12. Shaligram V., *Saligramanighantu*, Haritakyadi varga, P 81-82, Khemraja Shrilkrishnadas Prakashan, Mumbai, 1997.

13. *Studies of Medicinal Plants and Drugs in Dhanvantari-nighantu*, Edited by Kamat D. K. and Kamat S. D., Guducyadi, P 79, Chaukhamba Sanskrit Pratisthan, Delhi, 2002.

14. Kaiyadeva, *Kaiyadevanighantu*, Edited by Sharma P. V. and Sharma G. P., Pathyapathyavibhodakah, Oshadhivarga, P 47, Chaukhambha Orientalia, Varanasi, 2009.

15. Susruta, *Susrutasamhita*, Edited by Acharya Y. T. and Ram Narayana Acharya Kavyatritha, Sutrasthanam 14/70, P 47, Chaukhambha Surabharati Prakashan, Varanasi, 2002.

16. Bhavamisra, *Bhavaprakasanighantu*, Commentary by Chunekar K. C., Amradivarga, Verse 45, Volume 1, P 531, Reprint edition, Choukhamba Sanskrita Bhavana, Varanasi, 2013.

17. http://bmsi.ru/doc/2d48a3e3-807a-404a-b3a7-ddb04c1e2841 (browsed on 23.1.2019)

18. Whiting D., Guariguata L., Weil C. and Shaw J., IDF diabetes atlas: Global estimates of the prevalence of diabetes for 2011 and 2030, *Diabetes Research and Clinical Practice*, 94: 311e21, 2011.

19. Warburton D. E., Gledhill N. and Quinney A., The effects of changes in musculoskeletal fitness on health, The Canadian Journal of Applied Physiology, 26: P 161-216, 2001.

Authors

Aparajita Das, Post Graduate Scholar, Department of Swasthavritta, Sri Dharmashathala Manjunatheshwara College of Ayurveda and Hospital, Hassan- 573 201, Karnataka.

Tapas Brata Tripathy, Department of Swasthavritta, Sri Dharmashathala Manjunatheshwara College of Ayurveda and Hospital, Hassan- 573 201, Karnataka.

REVIEW STUDY
Āryavaidyan, Vol. XXXIII, No. 3, February - April 2020, Pages 48 - 54

Enhancing natural beauty through āyurveda

Geethu Balakrishnan and Akhilesh Shukla

ABSTRACT: Worldwide there is increasing awareness towards the natural and healthy way of living. The demand of natural food products which are free from chemical fertilizers and pesticides, herbal medicines, nature cure for ailments, herbal cosmetics, etc., are becoming preferred choice of the population. The global market of herbal cosmetic products is increasing to many folds. But it is also a bitter fact that synthetic cosmetics and other beauty care products are one of the main reasons of toxicity in human and in the name of beauty our health is put on the risk. Many of the synthetic cosmetics products contain high level of harmful ingredients including mercury which are proven for its systemic and local hazardous effects. The plant based cosmetic products are used by human being since many centuries for enhancing beauty. These natural products are safe to use and free from any harmful effect. Āyurveda, which emphasizes the healthy living pattern, contains detail information for enhancing each aspects of our beauty through natural ways. The present article is intended to highlight the beauty care through āyurveda as per the classical texts. The harmful effect of synthetic cosmeceutical products which are published in reputed journals are also presented here. The efficacy of time-tested drugs of āyurveda even holds good in the light of the present-day researches. Āyurveda has a great to give in the field of beauty care and it need to be promoted in proper way so that the people should not be the victim of money-making cosmeceutical industries.

Key words: Āyurveda, Beauty care, Cosmetics, Cosmeceutical, Herbal

Introduction

Beauty is a multifaceted construct that has been studied to a great extent throughout history.[1] Everyone wishes to look attractive. Our preference for attractive faces exists from early infancy and is robust across age, gender and ethnicity.[2] Attractiveness often places attractive people in advantageous positions.[3,4] Several cosmetic products are widely used by people to look attractive irrespective of their ethnicity and socioeconomic status. Cosmetics is defined by their intended use as a material rubbed, poured, sprinkled, or sprayed on, introduced into, or otherwise applied to the human body for cleansing, beautifying, promoting attractiveness or altering the appearance.[5] Many of the available cosmetic products such as skin lotion, shampoo, nail polish and other personal care products contain chemical ingredients that lack safety data.[6] These are the cause of several local and systemic problems. A number of studies addressed cosmetic use and its adverse events.[5] Worldwide there is increasing awareness towards the natural and healthy ways of living. Āyurveda cosmetics which are plant based and natural are used by human being since many centuries for enhancing the natural beauty. The origins of āyurveda cosmeceuticals date back to the Indus Valley Civilization and it is very much prized for their safe and holistic action.[7] Herbal cosmetics are the products of cosmetic chemistry, a science that combines the skills of specialists in chemistry, physics, biology, medicines and herbs. Āyurveda, which emphasizes the healthy living pattern contains detail information for enhancing natural beauty. Caring each aspect of beauty along with perfect health can be well achieved with āyurveda.There is an increased propensity for the use of herbal cosmetics all over the world. This wave of change could be noticed in every nook, including the new launchings in the market. There are many factors which contribute to this greening up of the cosmetic industry. There is a paradigm shift in attitude towards chemical cosmetics. Āyurveda has a great to give in the field

of beauty care and it need to be promoted in proper way. Every aspects of beauty care including face care, lipcare, eyecare, oralcare, hair care, etc., are being dealt in āyurveda, needed to be explored and presented for the present era. The present article gives the glimpse of varieties of āyurveda cosmeceuticals which are explained in classics to make the person attractive and care his/her every aspects of physical beauty.

Face care

Mukha and netra prakṣāḷana (Face and eye wash): The main factor defining an individual's attractiveness is his or her face.[8] Facial beauty attracts easily and it has several positive outcomes such as in selection of mate or in job, etc. To maintain and enhance the natural beauty of face and eyes, decoction of bark of lactiferous trees (pañcakṣīrivṛkṣa) mixed with milk can be used as face and eyes wash. Other drugs such as, bhillotaka (*Chloroxylon swietenia*) or of āmalakī (*Phyllanthus emblica*) or naturally cool water or luke-warm water as per climatic conditions can also be used.[9] The drug bhillotaka has already been proven as possessing anti-oxidant, anti-microbial and anti-fungal properties.[10] Triphalā, which is traditionally used for face cleansing, having potent skin protective effects which is proven by *in-vivo* studies, also possess anti-oxidant property and is a re-builder for the skin structural proteins such as collagen and elastin, radical scavenging property, cellular senescence delaying property, as a stimulant for the selective gene cells and also provides hydration to the skin.[11] A group of five drugs collectively called as kṣīrivṛkṣa is a common reference found in āyurveda classics for facial cleansing. Table 1.

Table 1
Pañcakṣīrivṛkṣa and their Botanical name

Sanskrit name of Pañcakṣīrivṛkṣa	Botanical name
Nyagrodha	*Ficus bengalensis*
Udumbara	*Ficus glomerata*
Aśvattha	*Ficus religiosa*
Pariṣa	*Thespesia populnea*
Pḷakṣa	*Ficus lacor*

Out of the kṣīrivṛkṣa mentioned, the drug *Ficus bengalensis* has been proven for its anti-bacterial and anti-oxidant activities.[12] Anti-oxidant property of *Ficus glomerata* along with the drug,[13] *Ficus religiosa* is been a proven potent radical scavenger and of owing anti-oxidant properties.[14] Free radical scavenging and anti-oxidant potential of *Ficus lacor*[15] along with the known anti-psoriatic and anti-oxidant activities of drug *Thespesia populnea*[16] adds on to the potentiality of the squad of kṣīrivṛkṣa as a natural toner.

Mukhalepa (Face pack): Along with the face wash, ācārya have prescribed several mukhalepa (face-pack) to care and beautify the facial skin. These are used in tune with the seasonal changes and daily regimen. Specific drug combinations are mentioned for the different seasons. The herbal paste which is applied on face to treat acne, pimples, scars, marks and pigments are known as mukhalepa in āyurveda.[17] Based on their therapeutic uses they have been broadly classified as three types *viz.* doṣahara, viṣahara and varṇakṛta.[18] As the alleviator of doṣa, alleviator of poisonous effect and as promoter of complexion respectively. Lots of herbal combinations compiling each of these types can be traced from the āyurveda references. The herbal face pack combinations which are useful in different seasons[18] are depicted in Table 2.

Lip care

Oṣṭhasiktha (Lip balm): The lips are of great importance for the perception of beauty by humans.[19] Beautiful lips enhance facial attractiveness. Several lip care products which are available in market may contain harmful levels of toxic substances.[20] In a very simple way with home-based items, proper care of lips is possible. The text Kaiyyadevanighaṇṭu has mentioned a traditional form of lipstick for the protection of the oṣṭha (lips) in the form of oṣṭhasiktha (lip balm) by using beeswax.[21] It wards off the roughness, stiffness, pain and any discolorations of the lips. The recent researches have also proven that beeswax is a natural source of antibacterial agents

Table 2
Mukhalepa for different seasons

Name of the season	Mukhalepa combination
Hemanta (Early winter)	Cotyledon of kola (*Ziziphus mauritiana*), root of vṛṣa (*Adathoda vasica*), bark of śābaraka (*Symplocos racemosa*) and gaurasarṣapa (*Brassica alba*)
Śiśira (Extreme winter)	Root of simhī (*Solanum anguivi*), tila(*Sesamum indicum*), kṛṣṇa (*Piper longum*), bark of dārvī (*Coscinium fenestratum*) and dehusked barley (*Hordeum vulgare*)
Vasanta (Spring)	Root of darbha (*Desmostachya bipinnata*), hima (*Santalum album*), uśira (*Vetiveria zizanioides*) śirīṣa (*Albizia lebbeck*), misi (*Foeniculum vulgare* Mill) and taṇḍula (*Oryza sativa*)
Grīṣma (Summer)	Kumuda (*Nymphaea nouchali*), utpala (*Nymphaea stellata*), kalhāra (*Nymhoea alba*) durvā (*Cynodon dactylon*), madhūka (*Glycyrrhiza glabra*) and candana (*Pterocarpus santalinus*)
Varṣa (Prāvṛṭ) (Rainy)	Kaliyaka (*Aquilaria agallocha*), tila (*Sesamum indicum*), uśira (*Vetiveria zizaniodes*), māmsī (*Nardostachy jatamansi*), tagara (*Valerian awallichi*) and padmaka (*Prunus cerasoides*)
Śarad (Autumn)	Tālisa (*Abies webbiana*), gundra (*Saccharum arundinaceum*), puṇḍrāhva (*Saccharum officinarum*), yaṣṭhī (*Glycyrrhiza glabra*), kāśa (*Saccharum spontaneum*), nata (*Valerian awallichi*) and agaru (*Aquilaria agallocha*)

and could even prevent the charring and drying of the lips by maintaining the moisture. Also being a natural rich source of Vitamin A, it could prevent painful inflammation that comes with an infection, accelerate wound healing, reduce wrinkling and could resist the UV radiations.[22]

Eye care

Netrasiñcana and añjana (Sprinkling the eyes and eye-salves/ collyrium): Eyes form their own vocabulary and language in beautification of a person and hence special care for the protection of the same has been recommended in āyurveda. As a part of daily regimen in the early morning, it is instructed to do the siñcana (sprinkling) of the eyes with mouth full of water using cold water in grīṣma (summer) and śarad seasons (early autumn) while in all other seasons sprinkling is to be done using luke warm water. Suśruta has recommended the netraprakṣāḷana (eye wash) with the decoction of lodhra *(Symplocos racemosa)* or with the svarasa of āmalakī *(Emblica officinalis)*.[23] Collyrium called souvīrāñjana (Antimony sulphide processed with drugs) should be applied daily and the collyrium prepared from the drug dāruharidrā *(Berberis aristata)* called rasāñjana should be applied once in a week.[18a] Recent researches have proven that the methanolic extracts of the drug dāruharidrā has showed promising anti-microbial activity to Nocardia sp., S. pneumonia, E. coli, some of the major pathogens causing eye infections.[24] Bath on the head with warm water is always harmful to the eyes whereas the cold water on the head is considered beneficial to the eyes.[18b]

Oral care

Dantadhāvana (Teeth cleansing): Clean white teeth and smile augments facial beauty. Āyurveda also has recommendations for the oral care. Individualistic oral care recommendations of the science based on the body constitutions and climatic changes make it worthy. Brushing should be done in the early morning, before having the food, silently. Twigs used for this should be predominant of kaṣāya (astringent), tikta (bitter) or kaṭu (pungent) in taste.[18c] Twigs used should be of the known trees, straight and without any knots, collected from good places (not in crematorium, etc.), with soft ends, length of 12 aṅgula (approx.15 cm.) and thickness of end of the little finger.[18c] Among the mentioned tastes according to Suśruta, nimba is considered best among the bitter ones, khadira the best among astringent drugs, madhūka best among sweet drugs and karañja the best among pungent drugs.[9a] Also, the tastes should be selected considering the factors of kāla (seasons), doṣa and rasa. Till date many studies have proven the wide range of the drug nimba in mitigating oral diseases including its anti-bacterial activity, anti-candidial activity, anti-cariogenic activity and anti-plaque activities making it an inevitable ingredient in the present-day available toothpastes. Also, its

efficacy against acidogenic oral bacteria, periodontal pathogens and as a root canal irrigate reduces plaque deposition, prevents caries and enhances the overall oral health.[25]

Dantadhāvanacūrṇa: Tooth powder prepared from trikaṭu (ginger+ black pepper+ long pepper) or triphalā (*Terminalia chebula* + *Terminalia bellerica* + *Emblica officinalis*) mixed along with honey forms an excellent combination for the oral cleansing.[26] Teeth should be rubbed from down to up slowly without hurting the gums. Lower teeth are to be brushed first followed by the upper row.[18d] Powder of tejovati mixed with honey, trikaṭu and trijāta (tvak+ ela+ patra), oil and rock salt, recommended as an external mixture for the oral cleansing as per Suśrutasamhitā. Table 3 is showing the drugs useful for Dantadhāvana.

Table 3
Drugs mentioned for Dantadhāvana

Drug name	Botanical name
Vaṭa	*Ficus bengalensis*
Asana	*Pterocarpus marsupium*
Arka	*Calotropis gigantean*
Khadira	*Acacia catechu*
Karañja	*Pongamia pinnata*
Karavira	*Nerium indicum*
Sarja	*Shorea robusta*
Arimeda	*Acacia farnesiana*
Apāmārga	*Achyranthes aspera*
Mālati	*Jasminum grandiflorum*
Kakubha	*Terminalia arjuna*

Jihvānirlekhana (Tongue scraping): Sufficient space has been devoted in the classics for the Oral care including all its aspects. Jihvānirlekhana or tongue scraping is one such reference mentioned as part of the daily regimen improving the personal hygiene.[9b] Tongue scraper used for the same should be made of any of the metals of gold, silver or of steel as per the āyurveda classics. It should be soft, smooth and 10 aṅgula (approx.15cm) in length and able to eliminate dirt and helps in removing the accumulated filths and bad odour.

Gaṇḍūṣa and kabaḷa: Oral health is essential for our well-being. Gaṇḍūṣa and kabaḷa are one of the primary oral cleansing techniques which is useful in the management of more than 30 oral pathologies and of more as a best preventive tool.[27] In āyurveda classics, oil pulling by using simply the sesame oil is prescribed as a part of our daily regimen. Gradually it is becoming popular therapy for the management of various oral and dental ailments.[28]

Tāmbūlacarvaṇa: From archaeological evidences it was proved that the culture of chewing betel leaves along with the areca nut was known since ancient times.[29] Chewing betel leaves (tāmbūlacarvaṇa) along with some specific drugs and slaked lime (cūrṇa) bestows cleanliness and freshness to the oral cavity.[9] Various analytical research experiments on these drugs purified compounds, extracts and fractions have already proven for the properties of anti-diabetic, cardiovascular, anti-inflammatory, immunomodulatory, anti-ulcer, hepato protective and anti-infective properties.[30] Table 4 is showing the drugs which are added in tāmbūla.

Table 4
Drugs which are added while chewing betel leaves

Drug	Botanical name
Pūga	*Areca catechu*
Karpūra	*Cinnamomum camphora*
Jātiphala	*Myristica fragrans*
Kaṅkola	*Piper cubeba*
Lavaṅga	*Syzygium aromaticum*
Kaṭuka	*Hibiscus abelmoschus*

Hair care

Hair is often associated with an individual's identity and it has psychological, social and sometimes spiritual meaning.[31] Long thick black lustrous hair with time bound changes still are considered as a mark of beautification especially among the women. Women usually use their hair to establish a group identity.[32] Several references in all aspects of hair care can be seen in the āyurveda classics, such as- śirobhyaṅga (head massage), keśaprasādana (combing the hairs), keśāpamārjana (removal of unwanted hairs), etc. Śirobhyaṅga, provides softness to the hairs, make it lengthy, increase abundance, gives unctuousness and black shade. Keśaprasādana or combing the hairs daily removes dust, lice and wastes and thus is good for the hair. Keśāpamārjana[9c]

(removing undesirable hairs), wards off sin, bestows happiness, lightness and auspiciousness.

Foot care

Human foot is considered one of our most distinctive morphological and functional features.[33] It is highly complex and multi articular structure.[34] Keeping feet in healthy condition is essential for effective movements, promoting leg strength and reducing falls.[35,36] The planter skin of the sole is unique compared to skin of other body parts, it withstands and adapt to the external stresses during physical activities.[37,38] Proper foot self-care is commonly described as including nail and skin care, washing and drying the feet each day, doing foot exercises, and wearing socks and shoes that fit and are made of appropriate materials.[39] Āyurveda texts have included each aspects of foot care which are now highlighted by researchers to prevent foot problems.

Pādaprakṣāḷana[9d](Washing the feet): It removes dirt, diseases and fatigue and is considered as cakṣuprasādanam (bestows clear vision).

Pādābhyaṅga[9e,21a](Anointing oil to the feet): Foot is mentioned as an area for abhyaṅga which bestows sleep, comfort to the body, cakṣuṣya (good for eyes) and wards of fatigue and softens the skin of the feet.

Pādatradhāraṇa (Wearing footwear): Wearing footwear is recommended mainly to protect the foot and avoid any injury to marma or vital points situated there. Walking without footwear is always bad for health, life span and causes harm to the eyes. Pāduka prepared out of wood of palāśa *(Butea monosperma)* is prohibited. As the footwear directly interacts with the human body as having a social and sexual expressing role, it is crucial in protecting the foot and avoiding any injury to the marma (vital points) located there such as kṣipra, talahṛt, kūrca, kūrcaśira, etc.[9f,40]

Nail care

Nakhāpamārjana[9c,41] (Removing undesirable nail): It wards off sin, bestows happiness, lightness and auspiciousness. The nails should be trimmed on every fifth day.

Discussion

In the name of āyurveda cosmeceutical companies are growing rapidly and making huge profit but its authenticity is questionable. Humans have used cosmetics for thousands of years.[20] The rich experiential tradition of using natural products for self-beauty care and preparing various formulations as per specific need is the best way to protect our beauty. Āyurveda concept of beauty is invariably intermingled with the concepts of physical and mental wellbeing. Not just the face, but every part of the body aids to our beauty. Starting from the nails and hairs, āyurveda classics have described care for each and every part of our body. Several formulations which can be easily prepared in home are also described here. Climatic changes may affect our skin negatively and our ācārya have well described what kind of formulations are most suitable to our skin as per changing seasons. Svasthavṛtta, dinacaryā and ṛtucaryā are designed so well that just by following it, all aspects of our beauty are also taken care. There is growing concern of the people to learn the natural ways of enhancing and protecting beauty and our ancient wisdom can fulfil this need.

Conclusion

Every human being on this earth wish to look attractive. This desire has always been there and so only āyurveda texts have given sufficient space to describe every aspects of our beauty care. Unfortunately, the real information is missing and various companies takes advantage of the name of āyurveda and sell the beauty products only for economic gain. Such pseudo āyurveda cosmetic products are becoming cause for various health problems. The need is to provide the real information and make the people capable of self-beauty care.

Reference

1. Reber R., Schwarz N. and Winkielman P., Processing fluency and aesthetic pleasure: Is beauty in the perceiver's processing experience? *Personality and Social Psychology Review*, 8, P 364-382, 2004.

2. Rubenstein A. J., Langlois J. H. and Roggman L. A., What makes a face attractive and why: The role of averageness in defining Facial beauty. In: Rhodes G. and Zebrowitz L. A., Editors, *Facial Attractiveness Evolutionary, Cognitive, and Social Perspectives*, P 1-33, Westport, CT, Ablex Publishing, 2002.

3. Beall A. E., Can a new smile make you look more intelligent and successful? *Dental Clinics of North America*, 51: P 289-297, 2007.

4. Singh D., Mating strategies of young women: Role of physical attractiveness, *Journal of Sex Research*, 41, P 43-54, 2004.

5. Getachew M. and Tewelde T., Cosmetic use and its adverse events among Female employees of Jimma University, Southwest Ethiopia, *Ethiopian Journal of Health Sciences*, 28(6): P 717-724, 2018. [doi:10.4314/ejhs.v28i6.6]

6. Barrett J. R., The ugly side of beauty products, *Environmental Health Perspectives*, 113(1):A24, 2005. [doi:10.1289/ehp.113-a24]

7. Datta H. S. and Paramesh R., Trends in aging and skin care: Ayurvedic concepts, *Journal of Ayurveda and Integrative Medicine*, 1(2):P 110-113, 2010. [doi:10.4103/0975-9476.65081]

8. Mueser K. T., Grau B. W., Sussman S., et. al., You are only as pretty as you feel: facial expression as a determinant of physical attractiveness, *Journal of Personality and Social Psychology*, 46:P 469-478, 1984.

9. Susruta, *Susrutasamhita*, Edited by Jadavji Trikamji Acharya and Narayana Ram Acharya Kavyatirtha, Reprint Edition, Cikitsasthanam 24/15-16, P 487, Chaukhambha Surabharati Prakashan, Varanasi, 2008.

9a. Ibidem., Cikitsasthanam, Chapter 24, Sutra 5-6, P 487

9b. Ibidem., Cikitsasthanam, Chapter 24, Sutra 21, P 488.

9c. Ibidem., Cikitsasthanam, Chapter 24, Sutra 73, P 489.

9d. Ibidem., Cikitsasthanam, Chapter 24, Sutra 67, P 489.

9e. Ibidem., Sutrasthanam, Chapter 5, Sutra 90-92, P 42.

9f. Ibidem., Sarirasthanam, Chapter 6, Sutra 25, P 373.

10. Jayaprasad B., Sharavanan P.S. and Karthik K., *Chloroxylon swietenia* an IUCN red listed plant- medicinal uses, *International Journal of Research in Engineering and Bioscience*,Volume 2, Issue 6, P 213-217.

11. Sandeep Varma R. et.al., Protective effects of Triphala on Dermal fibroblasts and Human keratinocytes, *PLoS One*, Volume 11(1): e0145921, January 5 2016.

12. Baby Joseph S. and Justin Raj, An Overview- *Ficus bengalensis* Linn, *International Journal of Pharmaceutical Sciences Review and Research*, Volume 6, Issue 1, Article 005, January-February 2011.

13. Mehta Devansh, *Ficus racemosa* Linn. -A review on Experimental Lead Approch, *Inventi Rapid: Planta Activa*, Volume 2013, Issue I.

14. Dixit et. al., Anti oxidant properties of *Ficus religiosa* L. bark extract on Human keratinocytes, *Science of Advanced Materials*, Volume 8, Number 6, P 1221-1226(6), June 2016.

15. Rakesh Sindhu K. and Sandeep Arora, Free Radical Scavenging and Anti oxidant potential of *Ficus lacor* Buch. Hum., *Asian Journal of Pharmaceutical and Clinical Research*, Volume 6, Suppl. 5, 2013.

16. Rakesh Sindhu K, et. al.,Anti psoriatic and phytochemical evaluation of *Thespesia populnea* bark extracts,*International Journal of Pharmacy and Pharmaceutical Sciences*, Volume 1, Suppl. 1, November- December 2009.

17. Yadav N. and Yadav R., Preparation and Evaluation of Herbal face pack, *International Journal of Recent Scientific Research*, Volume 6, Issue 5, P 4334-4337, 2015.

18. Vagbhata, *Ashtangahrdayam* with Commentaries of Arunadatta and Hemadri, Edited by Vaidya Hari Sadasiva Sastri Paradakara, Sutrasthanam 22/14-22, P 300, Chaukhambha Surabharati Prakashana, Reprint edition, 2010, ISBN:978-93-80326-76-4.

18a. Ibidem., Sutrasthanam 2/5, P 25

18b. Ibidem., Sutrasthanam 2/17, P 28

18c. Ibidem., Sutrasthanam 2/2-3, P 24

18d. Ibidem., Sutrasthanam 2/3, P 24

19. Kar M., Muluk N. B., Bafaqeeh S. A. and Cingi C., Is it possible to define the ideal lips? *Acta Otorhinolaryngologica Italica*, 38(1), P 67- 72, 2018. doi:10.14639/0392-100X-1511.

20. Brown V. J., Metals in lip products: a cause for concern? *Environmental Health Perspectives*, 121(6), A196, 2013. [doi:10.1289/ehp.121-a196]

21. Kaiyadeva, *Kaiyadevanighantu*, Edited by Sharma P. V. and Sharma G. P., (Pathyapathya-Vibodhaka), Viharavarga, Sutra 56, P 494, Chaukhamba Orientalia, Varanasi, 2009, ISBN: 978-81-7637-142-1.

21a. Ibidem., Viharavarga, Sutra 185, (Pathyapathya-Vibodhaka), P 513.

22. Giedre Kasparaviciene et. al.,Evaluation of Beeswax Influence on Physical Properties of Lipstick Using Instrumental and Sensory Methods, *Evidence-Based Complementary and Alternative Medicine*, Volume 2016,

Article ID 3816460, 8 pages, 2016.

23.Susruta, *Susrutasamhita*, with Nibandhasangraha Commentary of Dalhana and Nyayacandrika Panjika of Gayadasa on Nidanasthanam, Edited by Vaidya Jadavji Trikamji Acharya, Cikitsasthanam 24/15-16, P 395, Choukhambha Surbharati Prakashan, Varanasi, 1994.

24. Tamilselvi Saravanakumar, Padma Venkata subramanian, Vasanthi N. S. and Manonmani E., Antimicrobial potential of Daruharidra (*Berberis aristata* DC) against the pathogens causing eye infection, *International Journal of Green Pharmacy*, July- September 2014.

25. Lakshmi T., et.al, *Azadirachta indica*: A herbal panacea in dentistry: An update, *Pharmacognosy Review*, 9(17), P 41-44, January- June 2015.

26. Vagbhata, *Ashtangasangraha*, Edited by Srinivas Rao P., Sutrasthanam 3/16, P 25, Chowkhamba Krishnadas Academy, Varanasi, 2005.

27. Shanbhag V. K., Oil pulling for maintaining oral hygiene - a review, *Journal of Traditional and Complementary Medicine*, 7(1), P 106-109, June 6 2016. [doi:10.1016/j.jtcme.2016.05.004.]

28. Naseem M., Khiyani M. F., Nauman H., Zafar M. S., Shah A. H. and Khalil H. S., Oil pulling and importance of traditional medicine in oral health maintenance, *International Journal of Health Sciences (Qassim)*, 11(4), P 65- 70, 2017.

29. Shetty S. R., Babu S., Kumari S., Prasad R., Bhat S. and Fazil K. A., Salivary ascorbic acid levels in betel quid chewers: A biochemical study, *South Asian Journal of Cancer*, 2(3), P 142-144, July 2013.[doi: 10.4103/2278-330X. 114127]

30. Rajendra Toprani and Daxesh Patel, Betel leaf: Revisiting the benefits of an ancient Indian herb, *South Asian Jornal of Cancer*, 2(3), P 140-141, July- September 2013.

31. Saed S., Ibrahim O. and Bergfeld W. F., Hair camouflage: a comprehensive review, *International Journal of Womens Dermatology*, 2017;3(1 Suppl):S75- S80. Published 16 February 2017. [doi:10.1016/j.ijwd.2017.02.016]

32. Manning Jodi, The Sociology of Hair: Hair Symbolism Among College Students, *Social Sciences Journal*, Volume 10, Issue 1, Article 11, P 35- 48, 2010. (Available at: http://repository.wcsu.edu/ssj/vol10/iss1/11.

33. Bates K. T., Collins D., Savage R., et. al., The evolution of compliance in the human lateral mid-foot, *Proceedings Biological Sciences*, 2013, 280(1769):20131818. Published 21 August 2013. [doi:10.1098/rspb.2013.1818]

34. Nester C. J., Jarvis H. L., Jones R. K., Bowden P. D. and Liu A., Movement of the human foot in 100 pain free individuals aged 18-45: implications for understanding normal foot function, *Journal of Foot and Ankle Research*, 7(1):51, Published 28 November 2014. [doi:10.1186/s13047-014-0051-8]

35. Menz H. B., Morris M. E. and Lord S. R., Foot and ankle risk factors for falls in older people: a prospective study, *The Journals of Gerontology*, A Biol Sci Med Sci.;61,P 866-870, 2006. [doi: 10.1093/gerona/61.8.866]

36. Yamashita K., Nomoto Y., Umezawa J., Miyagawa H., Kawasumi M., Koyama H., et al. Affect of shape abnormality in foot and toenail on tumbling of aged, *IEEJ Transactions on Electronics, Information and Systems*, 124, P 2057-2063, 2004.

37. Hashmi F., Nester C., Wright C., Newton V. and Lam S., Characterising the biophysical properties of normal and hyperkeratotic foot skin, *Journal of Foot and Ankle Research*, 8:35, 12 August 2015. [doi:10.1186/s13047-015-0092-7]

38. Swensson O., Langbein L., McMillan J. R., Stevens H. P., Leigh I.M., McLean W.H., et. al., Specialized keratin expression pattern in human ridged skin as an adaptation to high physical stress, *The British Journal of Dermatology*, 139(5), P 767- 775, 1998. [doi: 10.1046/j.1365-2133.1998.02499.x.]

39. Miikkola M., Lantta T., Suhonen R. and Stolt M., Challenges of foot self-care in older people: a qualitative focus-group study, *Journal of Foot and Ankle Research*,12:5, 18 January 2019. [doi:10.1186/s13047-019-0315-4]

40. Shukla Akhilesh et. al.,Importance of wearing footwear for healthy living: An Ayurvedic Perspective, *Journal of Biological and Scientific Opinion*, Volume 2(6), 2014.

41. Agnivesa, *Carakasamhita*, Elaborated by Caraka and Drdhabala, Ayurvedadipika commentary of Cakrapanidatta, Edited by Jadavji Trikamji Acharya, Sutrasthanam 8/19, P 59, Reprint edition, Chaukhamba Orientalia, Varanasi, 2007.

Authors

Geethu Balakrishnan, Assistant Professor, Department of Rasashastra and Bhaishajyakalpana, VPSV Ayurveda College, Kottakal, Malappuram Dist., Kerala.

Akhilesh Shukla, Assosiate Professor, Department of Ayurveda Samhita and Siddhanta, Government Ayurveda College, Bilaspur Dist., Chhattisgarh- 495 001.

CONCEPTUAL STUDY

Āryavaidyan, Vol. XXXIII, No. 3, February - April 2020, Pages 55 - 60

Conceptual study of Nāsāśarīra

Gunjan Sharma, Priyanka Dubey, Renu Rao, Aditi and Arun Kumar

ABSTRACT: Among three great treatises (bṛhattrayī) of āyurveda, Suśrutasamhitā represents main source of āyurveda which is related to diseases manifesting above the clavicular region that comes under Śālākyatantra. Nāsā is important physiological structure as well as prime structure of drug administration. Therefore gross understanding of the relative anatomy of nose is very important. In ancient literatures scattered and brief reference of nāsāśarīra (anatomy and physiology of nose) is available. In the present study, all the references regarding the anatomy of nose were collected from various samhitā and an effort has been put to establish a scientific and logical correlation of āyurveda terms and concept with modern nasal anatomy on the basis of theses references.

Key words: Nose, Nāsāśarīra

Introduction

In medical science, proper medical work cannot be done without knowing the smallest structure of human body. As mentioned by ācārya Caraka, detailed knowledge of human body is necessary for the well-being of a human being. With the help of consequential knowledge of normal structure and function of a particular organ, the pathology occurring in them can be understood. Knowing the importance of anatomy, ācārya have included the śarīrasthānam in samhitā for the complete human anatomical knowledge. Senses, which are also known as indriya are the important part of human body which are the sources of knowledge about any kind of subject or objects. Indriya are related to a particular organ, such as eye, nose, tongue, ear and skin which are named as ñjānedriya. In human body, each organ has their specific function and significance. Nose is an important sense organ. In samhitā, 'nāsā' is described not only as pratyaṅga but as the seat of ghrāṇendriya as well. Nāsā is related to the upper respiratory passage as well as a gateway of the brain (śiraḥ). In samhitā, detailed description of nāsāsandhāna is available which also indicates the knowledge of anatomy of nose.

Aims and objectives

1. To search the references related to nāsāśarīra in various samhitā.

2. To understand the concept of nāsāśarīra in samhitā and correlate with modern anatomy.

Materials and methods

This analysis consisted of a literature review, which encompasses data from books and published sources, related to āyurveda and modern precepts of the nose.

Literary review

Etymology

The word 'Nāsā' is formed by two words 'Nas (dhātu) + Ghan (pratyaya)'.[1]

Embryology

According to ācārya Caraka and Kaśyapa, development of all sense organs occurs during the third month of gestation.[2] In Garbhopaniṣad it is mentioned that nāsā (nose) developes in the sixth month of pregnancy.[3] Embryology of nose is incompetently described in textbooks, which are incomplete and controversies are found about the different embryological origins of the nasal bones, cartilages and soft tissue envelopes.

Pāñcabhautikatā

All the indriya (ñjānendriya, karmendriya and manas) are originated from sātvika or vaikārika ahaṅkāra and rājasika or tejasa ahaṅkāra.[4] Indriya are formed by the conglomeration of five elements with predominance of respective mahābhūta.[2a] Gandha (smell) is an instinctive character of pṛthvī mahābhūta[2b] and ghrāṇendriya has a predominance of pṛthvīmahābhūta. Nāsā is the adhiṣṭhāna of ghrāṇendriya (sense organ of smell).[2c]

Pramāṇa of nāsā

Pratyaṅga is considered as the secondary organ of the body and ācārya Suśruta has included nāsā in pratyaṅga.[4a] Measurements of organs are described in svāṅgula pramāṇa. Hence, the length of nāsā is 4 aṅgula[4b] and circumference of nāsāpuṭa is tribhāga aṅgula.[4c] Ācārya Ḍalhaṇa clarifying about, that each nostril is tribhāga aṅgula i.e 1-1/3 aṅgula.[5] Distance between the two eyes and the width of two nāsāpuṭa (ala) are equal that is 2 aṅgula.[4b] In modern, all the measurements of the nose are calculated in centimeters as the width of the nose is roughly 70% of the length of the nose and the width of the alar base is usually equal to the intercanthal distance.[6] The nares usually measure 1.5- 2 cm anteroposteriorly and 0.5-1 cm transversely.[6]

(1 aṅgula is equal to ¾ inches)[7]

Marma

Ḍalhaṇa has stated that the two marma are situated in nāsikā.[5a]

1. Phaṇa

2. Śṛṅgāṭaka

Āyurveda considered some vital parts of the body as prāṇasthāna and termed as marma. The injury to these marma points may cause serious consequences. Two phaṇa marma are situated internally in both sides of the ghrāṇamārga. Any injury to these marma can cause loss of sense of smell.[4d] Four śṛṅgāṭaka marma is formed by the śiras, which are related to the tongue, eyes, nose and ears.[4e] Four mātṛkā and sirā marma is also situated on each side of kaṇṭhanāḍi related to nāsā.[8]

Ideal nose

Ācārya Caraka has described some specific features of nose; the nose should be straight, with even nares, having good nasal bridge and the tip of the nose should be slightly bent down and well able to breathe.[2d] The nose having these characters shows normal nasal physiology and indicates the long and healthy life of the infant. Ācārya Vāgbhaṭa describes inauspicious symptoms of nose.[8a] Nose is an important and the external part of respiratory system. Hence, any kind of congenital deformity, disease or trauma which alters its shape, size or cavity will be harmful or life threatening for human being. Broad nasal bridge is a feature of hyperphosphatasia with mental retardation syndrome and macrocephaly- developmental delay syndrome. Infectious disease or genetic disorder can cause a low nasal bridge which is also called saddle nose. Cleidocranial dysostosis, Williams syndrome, Down syndrome, Fetal alcohol syndrome and Congenital Syphilis may cause low nasal bridge.

While explaining nasal disease ācārya have used various terms which indicate the anatomical structures of nose.

Nāsāsthi (Bony structure of nose)

According to ācārya Suśruta bony skeleton of external nāsā is formed by 3 asthi[4f] which are taruṇāsthi,[4g] while ācārya Caraka considered only 1 bone in nāsa.[2e] It can be concluded that among 3 bones, 2 are nasal bones and 1 is septal bone which consist of ethmoid and vomar bone.[9] External nose has a bony and cartilaginous structure. Upper 1/3rd part of the external nose is bony while lower 2/3rd is cartilaginous.[10]

Nāsā sandhi

There is only one and sthira type of sandhi present in nāsā.[4h] Most probably it is the joint between two nasal

bones. Ācārya Suśruta mentioned śiraḥ (cranial) and kapāla (forehead) have the tunnasevani type of sandhi. The nose is also related to head. So the same type of joint is found in the nose. Nose consisted of two parts: 1) Bony part: external part of the nose, which is formed by two nasal bones, they meet in the midline and rest on nasal process of frontal bone. Joints between two nasal bones and joint with frontal bone are fixed or immovable joints. 2) Cartilaginous part mainly formed by three cartilages upper, lower and lateral cartilages.

Peśi (Muscles of nose)

Nāsā has two peśi (muscle).[4i] Facial muscles bring about movement of the nose include procerus, nasalis (transverse and alar parts), levator labii superioris alaque nasi and depressor septi.[10a]

Nāsāgra (Tip of the nose)

Ācārya Vāgbhaṭa has used term 'nāsāgra' that indicates 'tip of the nose'.[8b]

Nāsāpuṭa (Ala of the nose)

Ācārya Ḍalhaṇa explain the term nāsāpuṭa and denotes the outer part of the nostril i.e. ala of the nose.[5b] Ala of the nose is the lower lateral surface of external nose, shaped by alar cartilage and covered by skin.

Nāsāvamśa

Here some references in classical āyurveda text, where the term nāsāvamśa has been used and the term nāsāvamśa indicates the external part of the nose which is the nasal bridge. Gananatha Sen also described nāsāvamśa as outer nasal part which covers the nasal cavity by bones and skin.[11] Boil on the nose,[4j] thick nasal skin and without any inflammation resemble like inflamed, are the fatal sign[2f] related to nāsāvamśa (nasal bridge). The length of nāsāvamśa (nose) is 4 aṅgula.[5c]

The nasal septum is a thin sheet of bone (posteriorly) and cartilage (anteriorly). It separates the left and right airway in the nose. The posterosuperior part of the septum and its posterior border are formed by the vomer bone. Nasal septum can be divided into three parts,[10b]

1. Columellar septum: Formed by medial crura of lower lateral cartilage.

2. Membranous septum: Consist of only double layer of skin.

3. Septum proper: Is a large quadrilateral septal cartilage.

Nāsārandhra (Nostril)

Nostrils are two external openings of the nasal cavity. Ācārya Caraka and Suśruta have considered two nostrils among the main nine external orifices.[2g] Ācārya Bhāvamiśra used term nāsārandhra for nostrils.[12] Ācārya Caraka has also included two nāsārandhra as malāyana (srotas containing mala).[2h]

Nāsikāsrota (Nasal cavity)

Ācārya Vāgbhaṭa while explaining about the patho-physiology of nāsikāśoṣa, told that the obstruction in the airflow is due to the narrowed nasal cavity.[8c] The nasal cavity is an irregular space between the roof of the mouth and the cranial base. It is divided by a vertical midline osseocartilaginous septum. The parameters of the intranasal spaces depend on age and gender. The growth is usually completed by the age of 16 years.[6a] The nasal vestibule lies just inside the naris.[6a]

Ghrāṇa

Ācārya Caraka has mentioned that nāsā (nose) is the adhiṣṭhāna (seat) of ghrāṇendriya.[2i] Gannath Sen also accepted that ghrāṇendriya is the organ of the sense of smell.[11a] According to Aruṇadatta, ghrāṇa is the specially modified area of the internal nasal cavity which is responsible for the sense of smell (Olfactory area of the nose).[13] According to this it can be said that ghrāṇādhiṣṭhāna denotes the specific place of olfaction in the nose. 'Ghrāṇāśrita śḷeṣmāni' [4k] denotes that this specific part contains a particular

amount of mucous and when mucous became dried it causes abnormality.

In modern anatomy, the internal cavity of the nose has three parts; 1. Nasal vestibule- contains skin and hair follicles 2. Olfactory epithelium- lines olfactory region includes the root of nasal cavity and the area above the superior concha and 3. Respiratory mucosa- which contains lower two third parts of nasal cavity. Respiratory mucosa is formed by pseudostratified ciliated columnar, contains plenty of goblet cells and secrets mucus.[14]

Nasal reflex

Any type of irritation such as strong smells, strong sunrays and micro filaments like structures causes sneezing due to the mucosal reflex.[4l]

Ghrāṇamūla/ Nāsāmūla (Nasal cavity)

The word 'mūla' is mentioned for the root or an origin of organ. Here the term 'ghrāṇamūla' indicates the upper part of the nasal cavity.[2j] Gananath Sen also mentions that nāsāmūla as space between the two eyebrows.[11a]

Dhamanī (Nerve supply of nose)

Ācārya Suśruta mentioned 2 dhamanī in the nose, which are responsible for the sensation of smell.[4m] According to their function, it indicates the olfactory nerves, which is two in number and responsible for smell. Central filaments of the olfactory cells carry the sense of smell from the olfactory region of the nose, passes through cribriform plate and end in the olfactory bulb.[10c]

Sirā (Blood supply of nose)

According to ācārya Suśruta and Vāgbhaṭa, total 24 siras are present in nāsikā.[4n] Here the term 'sirā' is used in the sense of minor and major blood vessels and lymphatic vessels.[9a] This large number of blood vessels indicates very rich blood supply of nose. Both internal and external carotid arteries supply the nose. Sphenopalatine and greater palatine branches of internal maxillary artery which is the branch of external carotid artery supply posterior part of internal nose. Branches of facial artery, which is a branch of external carotid artery supply the anterior inferior part of the nasal cavity. Anterior and posterior ethmoidal branches of ophthalmic artery (branch of internal carotid artery) supply superior part of nasal cavity.[10d]

Functions of nose

- In classical āyurveda texts, a number of nasal diseases are described in which pathological changes occur in nasal passage like apīnasa, nāsāśoṣa, etc. Such type of pathology causes obstruction in normal inhalation and exhalation and also alteres the sense of smell or completely restrict to it. It indicates that nose is a part of respiration and sense of smell.

- 'Sānunāsika vākyatvam' which is a feature of nāsāraśa,[4o] indicates the contribution of nose during speech.

Nāsā sandhāna

Suśruta is well known for his innovative rhinoplasty technique. Suśrutasamhitā contains detailed descriptions of procedure of nāsāsandhāna (rhinoplasty) and treats the broken or ruptured nose through the use of vicinage skin flaps.[4p]

Discussion

Knowledge of anatomy is a crucial section of medical science. Medical work can not be done properly without understanding the anatomy and physiology of microstructure of human body. In āyurveda literature also, ācārya have explained about the development, function and structure of body parts. Indriya are responsible for all the senses and originate from the five elements (Pañcamahābhūta). According to ācārya, indriya are developed during the intrauterine life. The senses have a predominance of one mahābhūta according to their function and ghrāṇendriya is mainly constituted of pṛthvī-mahābhūta. The word ghrāṇa is derived from 'ghra'

dhātu which means 'to smell'.[15] Nose is the seat of ghrāṇendriya and gandha is the character of pṛthvīmahābhūta, which indicates that the function of olfaction is also related to the nose. All the nasal parts are mentioned in samhita but ācārya have described them briefly. Bones, muscles and joints are also described, but here is some difference from modern, regarding their numbers. The nose is a very delicate structure of face as some vital points relate to it such as marma. Śṛṅgāṭakamarma can be correlated with the cavernous sinus while 'phaṇa and mātṛkā' can be associated with the arteries and veins which are responsible for the blood circulation of the nose. The position of phaṇamarma also almost related to the dangerous area of face, so it can be said that any infection occurring in this area will be dangerous. The description of quick nasal reflexes and large number of blood vessels also supports the ācāryā's knowledge about the anatomy of nose. If we observe carefully, then it is found that ancient ācāryā have enough knowledge about the structure and function of the nose. Ācārya Suśruta described the detailed procedure of rhinoplasty and provides the basic principles of plastic surgery, which is not possible without adequate structural and functional knowledge of the nose.

Conclusion

Over viewing of all the references collected from classical āyurevda texts, it has been proved that ancient ācāryā were well aware of the anatomy and physiology of nose. But this valuable knowledge is scattered and concealed. Very wide descriptions and classification of human body organs are available in samhitā. According to ācārya Caraka minute structure can further classify, but they became uncountable and unreachable to sense organs.[2k] This may be due to lack of microscopic technique in that time. Today, modern technology has made it possible to see microstructures which could not be seen with bare eyes.

Reference

1. Raja Radhakant Dev, *Sabdakalpadruma*, Dwitiya Khanda, P 871, Reprint Edition, Nag Publishers, Delhi, 1988.

2. Agnivesa, *Carakasamhita*, Revised by Caraka and Drdhabala, Vidhytini Hindi Commentary by Pandit Kashinath Shastri and Pandit Gorakhanatha Chaturvedi, Sarirasthanam 4/11, P 870, Chaukhamba Bharti Akadami, Varanasi, 2009.

2a. Ibidem., Sarirasthanam 1/24, P 806

2b. Ibidem., Sarirasthanam 1/27, P 807

2c. Ibidem., Sarirasthanam 7/7, P 912

2d. Ibidem., Sarirasthanam 8/51, P 954

2e. Ibidem., Sarirasthanam 7/6, P 912

2f. Ibidem., Indriyasthanam 8/10, P 1000

2g. Ibidem., Sarirasthanam 7/12, P 914

2h. Ibidem., Sutrasthanam 7/42, P 167

2i. Ibidem., Sarirasthanam 7/7, P 79

2j. Ibidem., Cikitsasthanam 8/48, P 285

2k. Ibidem., Sarirasthanam 7/17, P 917

3. *Garbhopanishad*, 17/3, Sanskritdocuments.org, August 2016, sanskrit@cheerful.com , P 2.

4. Susruta, *Susrutasamhita*, with Ayurveda Tatvasandeepika Hindi Commentary by Kaviraj Ambikadutta Shastri, Sarirasthanam 1/4, P 1, Chaukhamba Sanskrit Series, Varanasi, 2014.

4a. Ibidem., Sarirasthanam 5/4, P 54

4b. Ibidem., Sutrasthanam 35/13, P 169

4c. Ibidem., Sutrasthanam 35/14, P 169

4d. Ibidem., Sarirasthanam 6/28, P 75

4e. Ibidem., Sarirasthanam 6/28, P 75

4f. Ibidem., Sarirasthanam 5/ 21, P 57

4g. Ibidem., Sarirasthanam 5/ 22, P 60

4h. Ibidem., Sarirasthanam 5/29-30, P 61

4i. Ibidem., Sarirasthanam 5/48, P 64

4j. Ibidem., Sutrasthanam 32/4, P 161

4k. Ibidem., Uttaratantram 22/17, P 143

4l. Ibidem., Uttaratantram 22/12, P 140

4m. Ibidem., Sarirasthanam 9/5, P 93

4n. Ibidem., Sarirasthanam 7/24, P 83

4o. Ibidem., Nidanasthanam 2/19, P 310

4p. Ibidem., Sutrasthanam 17/49-50, P 90

5. Susruta, *Susrutasamhita* with Nibandhasangraha Commentary of Dalhana and Nyayachandrika Panjika of

Gayadasa on Nidanasthanam, Edited by Vaidya Jadvji Trikamji Acharya, Sutrasthanam 35/12, P 151, Reprint Edition, Chaukhambha Sanskri Sansthan, Varanasi, 2019.

5a. Ibidem., Sarirasthanam 6/ 27, P 374

5b. Ibidem., Sutrasthanam 35/12, P 150

5c. Ibidem., Sutrasthanam 35/12, P 151

6. Susan Standring, *Gray's Anatomy*- The Anatomical Basis of Clinical Practice, 41st Edition, P 556, Elsevier Limited, 2016.

6a. Ibidem., Section 4, Head and Neck, P 559

7. Dheeman K. S., *Salakyatantrakriyakalpavigyan*, 1st Edition, Chaukhambha Vishvabharti, Varanasi, 2013.

8. Vagbhata, *Ashtangahrdayam*, Vidhyotini Hindi Commentary by Kaviraj Atridev Gupta, Sarirasthanam 4/ 28, P 267, Chaukhambha Prakashan, Varanasi, 2009.

8a. Ibidem., Sarirasthanam 5/8, P 274

8b. Ibidem., Uttaratantram 19/5, P 701

8c. Ibidem., Uttaratantram 19/16, P 705

9. Susruta, *Susrutasamhita Sarirasthanam*, Ayurveda-rahasyadipika Hindi Commentary by Bhaskar Govinda Ghanekar, Sarirasthanam 5/21, P 158, Meharchanda Lachhamandas Publications, New Delhi, December 2010.

9a. Ibidem., Sarirasthanam, P 209

10. Mohan Bansal, *Diseases of Ear, Nose and Throat with Head and Neck Surgery*, Chapter 2, P 32, 2nd Edition, Jaypee Brothers Medical Publishers (p) Ltd., 2018.

10a. Ibidem, Chapter 2, P 29

10b. Ibidem., Chapter 2, P 34

10c. Ibidem., Chapter 2, P 37

10d. Ibidem., Chapter 2, P 36

11. Gananath Sen, *Pratyakshasariram*, Tritiyabhaga, Nadi-ganda-indriya-khanda-varnanam, Pancama adhyaya, P 227, Kalpataru Press, Calcutta, 1992.

11a. Ibidem., P 230

12. Bhavamishra, *Bhavaprakasa*, Translated by Shrikantha Murthy K. R., Volume 1, Purvakhanda, Dinacarya 5/305, P 117, Chowkhamba Krishnadas Academy, Varanasi, 2004.

13. Vagbhata, *Ashtangahrdayam*, Sarvangasundari Commentary by Arunadatta and Ayurvedarasayana by Hemadri, Edited by Vaidya Hari Sadasiva Sastri Paradakara, Sarirasthanam 3/3, P 385, Chaukhamba Surbharti Prakashan, Varanasi, 2018.

14. Dhingra P. L., Shruti Dhingra and Deeksha Dhingra, *Diseases of Ear, Nose and Throat and Head and Neck Surgery*, P 138, 6th Edition, Elsevier, Reed Elsevier India Private Limited, New Delhi, 2014.

15. Kashinath Sharma, *Sanskritdhatu Kosh*, Hindi Commentary, P 33, Lakshmivenkateshwara Publication, Mumbai, 1963.

Authors

Gunjan Sharma, Professor and Head, Department of Post Graduate studies in Shalakyatantra, Rishikul Campus, Uttarakhand Ayurved University, Dehradun, Uttarakhand.

Priyanka Dubey, Second Year Post Graduate Scholar, Department of Post Graduate studies in Shalakyatantra, Rishikul Campus,Uttarakhand Ayurved University, Dehradun, Uttarakhand.

Renu Rao, Associate Professor, Department of Post Graduate studies in Shalakyatantra, Rishikul Campus, Uttarakhand Ayurved University, Dehradun, Uttarakhand.

Aditi, Assistant Professor, Department of Post Graduate studies in Shalakyatantra, Rishikul Campus, Uttarakhand Ayurved University, Dehradun, Uttarakhand.

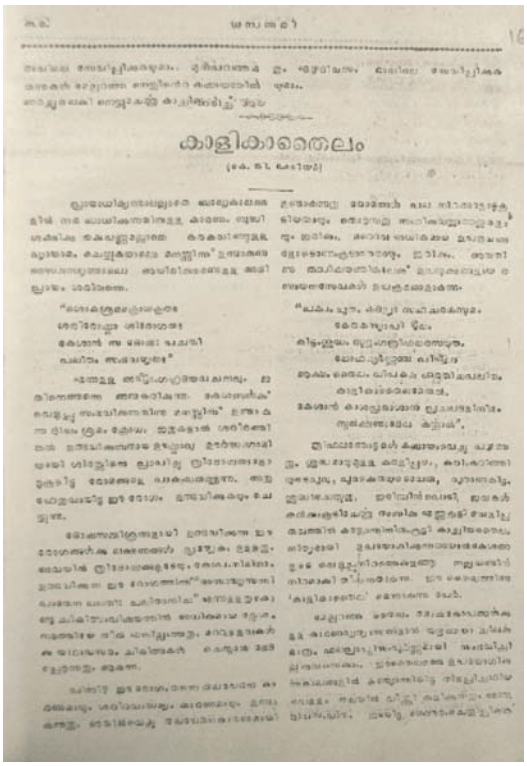
Arun Kumar, Assistant Professor, Department of Post Graduate studies in Shalakyatantra, Rishikul Campus, Uttarakhand Ayurved University, Dehradun, Uttarakhand.

Āryavaidyan, Vol. XXXIII, No. 3, February - April 2020, Page 61

Kāḷikā tailam

Varier K. G.

Dhanvantari is the first medical journal in Malayalam published every month by Vaidyaratnam P. S. Varier from Arya Vaidya Sala uninterruptedly for 23 years from 1903 to 1926. This clinical note was published in its column on Book No. 8, 1086 Kanni Malayalam Era (1911 CE), Article No. 3, Page 16.



കാളികാതൈലം

Over exercise and mental stress are the two main factors that are attributed to early graying.

Śokaśramakrodhakṛtāḥ
śarīroṣmā śirogataḥ |
Keśān sa doṣaḥ pacati
palitam sambhavatyataḥ ||
(Aṣṭāṅgahṛdayam)

Again, this śḷoka emphasizes the afore mentioned concept. The heat produced because of grief stress and anger affects the brain which in turn disturb the tridoṣa and trigger graying.

"Asādhya sannipātena khalatiḥ palitāni ca". Here, one can find different symptoms pertaining to such complicated combinations; one has to be very judicious while treating such cases.

Headache also is a causative factor besides aging. Multi colored hair growth is seen in this case with acute pain when touched. Whereas graying due to aging does not show any such symptoms. The suitable rasāyana are as under:

Pakvam pūtam kadaḷyā sahacarakusumam
ketakasyāpi mūlam
kiṭṭam śuddham subhṛṅgatriphalarasayutam
lohacūrṇañca piṣṭvam |
Ākṣam tailam vipakvam harati ca palitam
kāḷikātailametat ||
Keśān kāśaprakāśān pracaladaḷinibham
statkṣaṇādeva kuryāt

Make a decoction of triphalā, ripe banana of 'kadaḷi' variety, flower of sahacarā, roots of ketakī purified purāṇakiṭṭam, powdered iron; these are to be mixed with kalka, vibhītakī mixed with gingily oil and juice of bhṛṅgarāja is the formula for Kāḷikātailam. Daily use of this can work wonders! The grey hairs turn jet black as that of a beetle.

In few cases, this may not be very effective because of the varied conditions. During this period use of boiled and cooled water with bhṛṅgarāja is advised for bath. Every five days, shaving the head is also advised for quick results.

Translated by: Rati Vijayan, Publication Department, Arya Vaidya Sala, Kottakkal, Kerala.

STATEMENT ABOUT OWNERSHIP AND OTHER PARTICULARS ABOUT NEWSPAPERS

(Aryavaidyan - Form II vide Rule 3)

1. Place of Publication	:	Kottakkal
2. Periodicity of its Publication	:	Quarterly: 4 times a year
3. Printer's name	:	P.K. Warrier
Nationality	:	Indian
Address	:	Managing Trustee, Arya Vaidya Sala, Kottakkal- 676 503, Malappuram Dist., Kerala State. (Printed at Geethanjali Offset Prints, Kozhikode)
4. Publisher's name	:	P.K. Warrier
Nationality	:	Indian
Address	:	Managing Trustee, Arya Vaidya Sala, Kottakkal- 676 503, Malappuram Dist., Kerala State.
5. Editor's name	:	Prof. (Dr.) K.G. Paulose
Nationality	:	Indian
Address	:	Publication Division, Arya Vaidya Sala, Kottakkal- 676 503, Malappuram Dist., Kerala State.
6. Name and address of individuals who own the Newspaper and Partners or Shareholders, holding more than 1% of the total Capital.	:	Arya Vaidya Sala, Kottakkal. (A Charitable Trust).

I, P.K. Warrier hereby declare that the particulars given above are true to the best of my knowledge and belief.

Sd/-
P.K.WARRIER
Publisher

Kottakkal
15-2-2020

We invite papers on clinical research, clinical experiences, medicinal plants, drug development, drug processing and drug standardisation and also book reviews...

The language of the journal is English. All the manuscripts published are reviewed by eminent scholars around the globe.

The contents of the papers shall be the sole responsibility of the authors and publication shall not imply the concurrence of the Editors or Publishers. Manuscripts that are not accepted for publication will not be returned. Authors will be informed within three months of submission of manuscripts if they are recommended for publication in the journal. One copy of the journal will be sent to the author.

Manuscript presentation

Manuscript must be typed double spaced with margins of one inch (2.5cm) at the top, bottom and the sides and all pages numbered starting from the title page. 12 point Times New Roman font must be used and remain uniform throughout the text.

The manuscript should be divided into:

i. Title page
ii. Second page with article title and Abstract (maximum 300 words for full papers and reviews or 200 words for short communications; without the use of references) followed by 3-5 key words
iii. Introduction (state the objectives of the investigation with an adequate background)
iv. Materials and methods (provide adequate details to enable others to reproduce; previously reported methods should be cited by a reference with a brief description of modifications)
v. Results (clear and concise) and discussion separately or in combination is acceptable
vi. Conclusion - clearly and logically stated conclusion
vii. Acknowledgements (should include credit to technical assistance, financial support and other appropriate recognition)
viii. References
ix. Tables
x. Captions of figures
xi. Figures

Research papers, review articles and short communications must be limited to 5000, 4000 and 2000 words in length respectively. The articles/papers (in MS Word format) may be sent to publications@aryavaidyasala.com. For more details visit www.aryavaidyasala.com

Book Review

Authors/Publishers who wish their books to be reviewed in this journal are requested to send two copies of the same to the editor.

ARYAVAIDYAN

SUBSCRIPTION/RENEWAL SLIP

I wish to subscribe to the journal Aryavaidyan for ☐ 1 year ☐ 2 years ☐ 4 years

I am sending DD/MO/ for Rs.....(Rupees.....only).

Name: _____

Address: _____

_____

_____ Pin: _____

Phone: _____ E-mail: _____

Date: Signature:

HOW TO SUBSCRIBE

i Please fill in your name and address (in block letters)

ii Tick the box to indicate the period of your subscription.

iii Detach the slip and mail it at your earliest.

iv Medical students should attach a bonafide certificate from the college for availing of the discount allowed.

v Subscription fee is to be made either by money order or by a demand draft (State Bank of India (Code 70269) / Canara Bank (Code 338) / Vijaya Bank (Code 2017) / Punjab National Bank (Code 4297)) in favour of Arya Vaidya Sala, Kottakkal.

For Online Payment

SB A/c Name : Arya Vaidya Sala, Kottakkal
Account Number : 57021886014
IFSC : SBIN 0070269

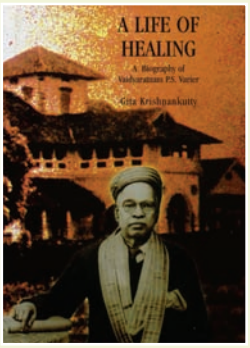
Information to *publications@aryavaidyasala.com* will be appreciated after making the payment.

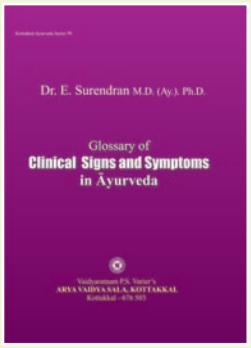
SUBSCRIPTION RATES

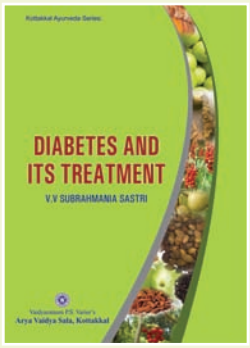
In India		*Out of India (postal charges extra)*	
Annual subscription	: ₹ 400/-	Annual subscription	: $ 50
Single copy	: ₹ 120/-	Single copy	: $ 15

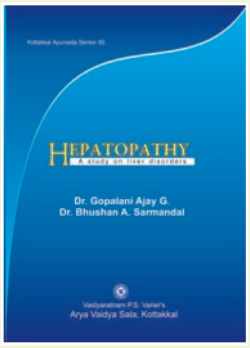
Concessional rate for bonafide students of all systems of medicines in India

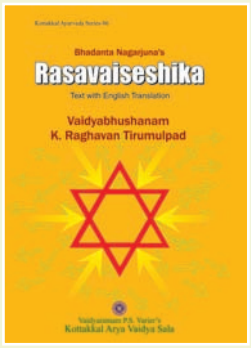
Annual subscription	: ₹ 320/-	Single copy	: ₹ 90/-

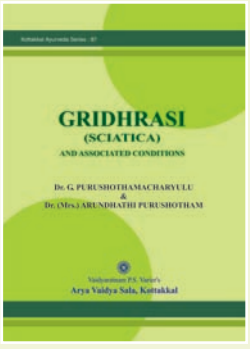


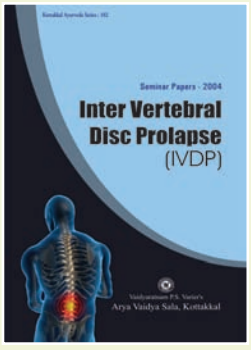


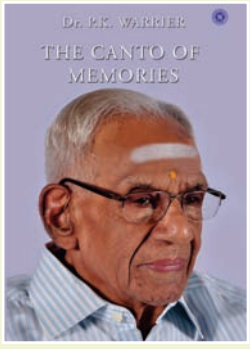


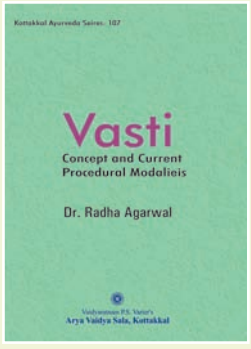


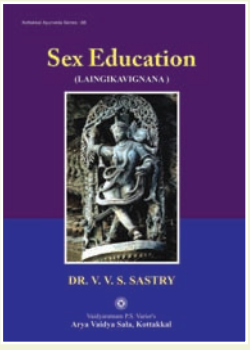


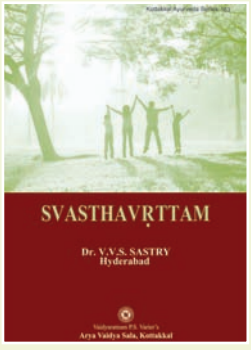


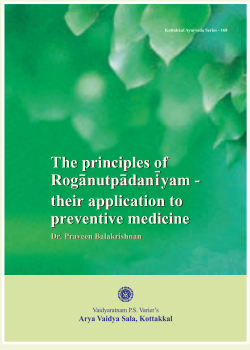


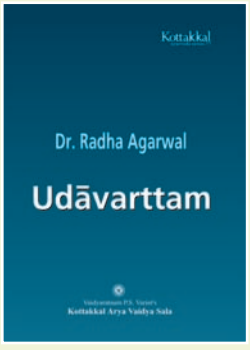


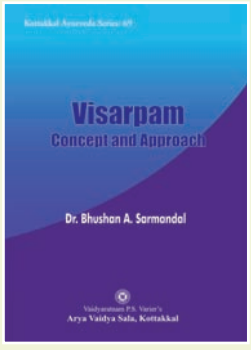


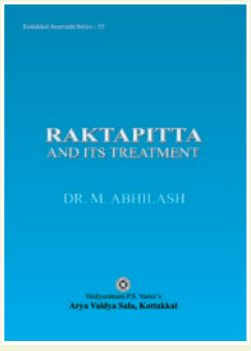


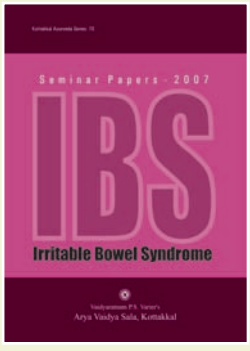


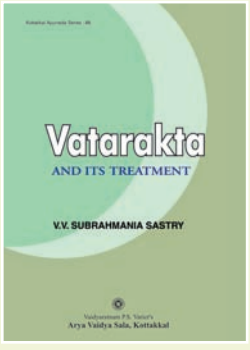


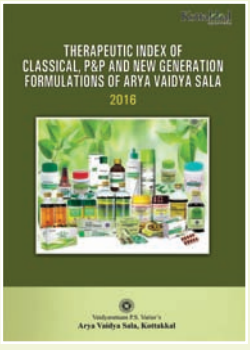


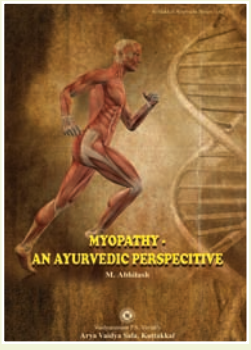


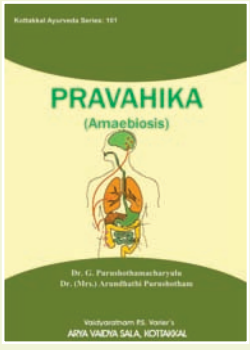


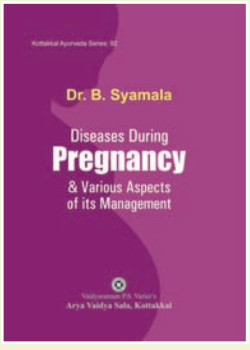


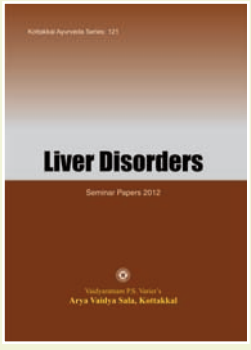












Kottakkal Ayurveda Series, Popular Ayurveda Series, Fine Arts - Kathakali Literature, Journal, Souvenirs etc.
Phone: 0483 - 2742225/2746665 E-mail: publications@aryavaidyasala.com Web site: www.aryavaidyasala.com