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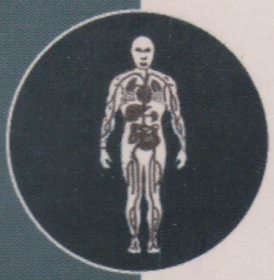
लाभानां श्रेय आरोग्यम्

Of all the gifts,
the most precious is health



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February - April 2004

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āryavaidyan

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Aryavaidyan is intended to encourage scientific writing and intellectual interactions among scholars, academicians, practitioners and students of ayurveda and allied subjects like Siddha, Unani, modern medicine, etc.

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Quarterly journal of Arya Vaidya Sala

सततायध्ययनं, 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

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FROM THE PAGES OF VAGBHATA - LXIV

N.V.K. Varier

Abstract: The discussion on the process of bloodletting through veins is continued. In this issue, the dos and don'ts after bloodletting are discussed; the qualities of pure blood in human being are also explained.

मांसळे निक्षिपेद्देशे व्रीह्यास्यं व्रीहिमात्रकम् ।
यवार्धमस्थ्नामुपरि सिरां विध्यन् कुठारिकाम् ।। ३३ ।।

(Māṁsaḷē nikṣipēddēśē
vrīhyāsyaṁ vrīhimātrakam ।
yavārdhamasthnāmupari
sirāṁ vidhyan kuṭhārikām ।।33 ।।)

At fleshy parts, the *sastra* to be used is *vreehimukha*, and the vein is to cut in the size of a rice grain only. The vein on a bone is cut to the size of half of a barley grain, and it is done with *kutharika* (axe).

सम्यग्विद्धा स्रवेद्धारां यन्त्रे मुक्ते तु न स्रवेत् ।
अल्पकालं वहत्यल्पं, दुर्विद्धा तैलचूर्णनैः ।। ३४ ।।
सशब्दमतिविद्धा तु स्रवेद्दुःखेन धार्यते ।

(Samyagviddhā sravēddhārāṁ
yantrē muktē tu na sravēt ।
alpakālaṁ vahatyalpaṁ,
durviddhā tailacūrṇanai: ।।34 ।।
Saśabdamatividdhā tu
sravēddu:khēna dhāryatē ।)

If properly cut, the blood flow is stream like, and when the bandage is removed, it stops. If the cut is improper, the flow would be very little and for a short time like droplets of oil. If excessively cut, the blood flows out with a sound and would be difficult to control.

भीमूर्च्छायन्त्रशैथिल्यकुण्ठशस्त्रातितृप्तयः ।। ३५ ।।
क्षामत्ववेगितास्वेदा रक्तस्यासृतिहेतवः ।

(bhīmūrcchāyantraśaithilyakuṇṭha-
śastrātitṛptaya: ।।35 ।।
Kṣāmatvavēgitāsvēdā
raktasyāsrutihētava: ।)

The causes of non-flowing of blood are - fear, fainting, looseness of bandage, bluntness of the instrument, over satiation, weakness, excited condition due to natural urges and lack of proper sudation.

असम्यगस्रे स्रवति वेल्लव्योषनिशानतैः ।। ३६ ।।
सागरधूमलवणतैलैर्दिह्याच्छिरामुखम् ।
सम्यक्प्रवृत्ते कोष्णेन तैलेन लवणेन च ।। ३७ ।।

(asamyagasrē sravati
vēllavyōṣaniśānatai: ।।36 ।।
Sāgaradhūmalavaṇatailair-
dihyācchirāmukham ।
samyakpravṛttē kōṣṇēna
tailēna lavaṇēna ca ।।37 ।।)

If the blood flows improperly, smear a preparation made with *vidanga* (*Embelia ribes*)

seeds, *vyosha* (*Zingiber officinale, Piper nigrum* and *Piper longum*), *nisa* (*Curcuma longa*), *nata* (*Valeriana jatamansi*), *agaradhooma* (soot), *lavana* (salt) and *taila* on the cut end of the vein. If blood flows properly, smear warm oil and *lavana* on the site.

अग्रे स्रवति दुष्टास्रं कुसुम्भादिव पीतिका ।
सम्यक्स्रुत्वा स्वयं तिष्ठेच्छुद्धं तदिति नाहरेत् ।। ३८ ।।

(Agrē sravati duṣṭāsraṁ
kusumbhādiva pītikā ।
samyaksrutvā svayaṁ tiṣṭhē-
cchuddhaṁ taditi nāharēt ।।38 ।।)

When the vein cut, impure-blood flows out first just like the colour of *kusumbha* flower, which although contains both red and yellow colors, releases yellow color at first; after proper flowing, the blood flow stops by itself. As the remaining blood is pure, do not try to extract it further.

यन्त्रं विमुच्य मूर्च्छायां वीजिते व्यजनैः पुनः ।
स्रावयेन्मूर्च्छति पुनस्त्वपरेद्युस्त्र्यहेऽपि वा ।। ३९ ।।

(Yantraṁ vimucya mūrcchāyāṁ
vījitē vyajanai: puna: ।
srāvayēnmūrcchati puna-
stvaparēdyustryahēSpi vā ।।39 ।।)

If the patient faints during bloodletting, release the *yantra* and fan him till he recovers; then try again. If the fainting recurs, postpone bloodletting to the next or third day.

वाताच्छ्यावारुणं रूक्षं वेगस्राव्यच्छफेनिलम् ।
पित्तात् पीतासितं विस्रमस्कन्धौष्ण्यात्स-
चन्द्रिकम् ।। ४० ।।
कफात् स्निग्धमसृक्पाण्डु तन्तुमत्पिच्छिलं घनम् ।
संसृष्टलिङ्गं संसर्गात् त्रिदोषं मलिनाविलम् ।। ४१ ।।

(Vātācchyāvāruṇaṁ rūkṣaṁ
vēgasrāvyacchaphēnilam ।
pittāt pītāsitaṁ visra-
maskandhauṣṇyātsacandrikam ।।40 ।।
Kaphāt snigdhamasṛkpāṇḍu
tantumatpicchilaṁ ghanam ।
saṁsṛṣṭaliṅgaṁ saṁsargāt
tridōṣaṁ malināvilam ।।41 ।।)

If the blood is vitiated by *vata*, it will be dark brown in colour, rough in nature, with quick flow, and frothy; if vitiated by *pitta*, it will be yellow or black colour, foul smelling, non-coagulating due to the hot property of *pitta*, and having multi colours like the eye of a peacock's feather. If vitiated by *kapha*, it will be unctuous, pale in colour, thready, slimy and thick. In the case of vitiation of two *dosha*s, the mixed symptoms will appear. In combination of three *dosha*s, the blood will be dirty and turbid.

अशुद्धौ बलिनोऽप्यस्रं न प्रस्थात्स्रावयेत्परम् ।
अतिस्रुतौ हि मृत्युः स्याद्दारुणा वा चलामयाः ।। ४२ ।।
तत्राभ्यङ्गरसक्षीररक्तपानानि भेषजम् ।

(Aśuddhau balinōSpyasraṁ
na prasthātsrāvayētparam ।
atisrutau hi mṛtyu: syād-
dāruṇā vā calāmayā: ।।42 ।।
Tatrābhyaṅgarasakṣīra-
raktapānāni bhēṣajam ।।43 ।।)

The vitiated blood should not be let out more than one *prastha** even though the patient is strong enough. In the case of excessive bleeding, either death or serious diseases due to *vata* provocation may occur; here the remedy is anointing the body with oil, and intake of meat soup, milk or blood itself.

*Here one *prastha* is equal to 13½ *pala*s

स्रुते रक्ते शनैर्यन्त्रमपनीय हिमाम्बुना ।। ४३ ।।
प्रक्षाळ्य तैलप्ळोताक्तं बन्धनीयं सिरामुखम् ।
(srutē raktē śanairyantra-
mapanīya himāmbunā ।।43 ।।
Prakṣāḷya tailapḷōtāktaṁ
bandhanīyaṁ sirāmukham ।)

After blood letting, the *yantra* is removed slowly, the site washed with cold water and then covered with a piece of cloth soaked in oil and bandaged.

अशुद्धं स्रावयेद्भूयः सायमह्न्यपरेऽपि वा ।। ४४ ।।
स्नेहोपस्कृतदेहस्य पक्षाद्वा भृशदूषितम् ।
(aśuddhaṁ srāvayēdbhūya:
sāyamahnyaparēऽpi vā ।।44 ।।
Snēhōpaskṛtadēhasya
pakṣādvā bhṛśadūṣitam ।)

Impure blood is let again on the same evening or on the next day; if it is excessively vitiated, then, after a fortnight; the patient is again subjected to oleation and sudation prior to the bloodletting.

किञ्चिद्धि शेषे दुष्टास्रे नैव रोगोऽतिवर्तते ।। ४५ ।।
सशेषमप्यतो धार्यं न चातिस्रुतिमाचरेत् ।
(kiñciddhi śēṣē duṣṭāsrē
naiva rōgōऽtivartatē ।।45 ।।
Saśēṣamapyatō dhāryaṁ
na cātisrutimācarēt ।)

If the impure blood retained is only a little, it does not act as provocative of any diseases; hence this retention is permissible. Do not commit to excessive bloodletting.

हरेच्छृङ्गादिभिः शेषम् प्रसादमथवा नयेत् ।। ४६ ।।
शीतोपचारपित्तास्रक्रियाशुद्धिविशोषणैः ।
दुष्टं रक्तमनुद्रिक्तमेवमेव प्रसादयेत् ।। ४७ ।।
(harēcchṛṅgādibhi: śēṣam
prasādamathavā nayēt ।।46 ।।
Śītōpacārapittāsra-
kriyāśuddhiviśōṣaṇai: ।
duṣṭaṁ raktamanudrikta-
mēvamēva prasādayēt ।।47 ।।)

The retained blood can be removed by using horn, *alabu*, *ghati*, etc. or pacify it by cold application; remedies prescribed in *raktapitta*, or purificatory and reducing processes are also applicable. The blood vitiated, but not increased, can be cleared in these ways.

रक्ते त्वतिष्ठति क्षिप्रं स्तम्भनीमाचरेत्क्रियाम् ।
(Raktē tvatiṣṭhati kṣipraṁ
stambhanīmācarētkriyām ।)

If the flow of blood does not stop, procedures should be taken to stop it immediately.

रोध्रप्रियङ्गुपत्तङ्गमाषयष्ट्याह्वगैरिकैः ।। ४८ ।।
मृत्कपालाञ्जनक्षौममषीक्षीरित्वगङ्कुरैः ।
विचूर्णयेद्व्रणमुखं पद्मकादिहिमं पिबेत् ।। ४९ ।।
तामेव वा सिरां विध्येद्व्यधात्तस्मादनन्तरम् ।
सिरामुखं वा त्वरितं दहेत्तप्तशलाकया ।। ५० ।।
(rōdhrapriyaṅgupattaṅgamāṣa-
yaṣṭyāhvagairikai: ।।48 ।।
Mṛtkapālāñjanakṣauma-
maṣīkṣīritvagaṅkurai: ।
vicūrṇayēdvrṇamukhaṁ pad-
makādihimaṁ pibēt ।।49 ।।
Tāmēva vā sirāṁ vidhyēdvyadhā-
ttasmādanantaram ।
sirāmukhaṁ vā tvaritaṁ
dahēttaptaśalākayā ।।50 ।।)

At the cut end of the vein, sprinkle the powder of *rodhra* (*Symplocos cochin-chinensis*), *priyangu* (*Callicarpa macrophylla*), *patanga*

(*Caesalpinia sappan*), *masha* (*Vigna mungo*), *yashtyahva* (*Glycyrrhiza glabra*), *gairika* (red ochre), *mritkapala* (cut pieces of earthen pot), *anjana* (black antimony), *kshauma mashi* (ashes of flax) and the bark and sprouts of four fig (*Ficus racemosa, Ficus microcarpa, Ficus religiosa* and *Ficus benghalensis*) trees. Cold infusion of *Padmakadigana* drugs can be taken as a drink. Or the same vein should be cut again next to the previous cut, or cauterise the cut-end quickly.

उन्मार्गगा यन्त्रनिपीडनेन
स्वस्थानमायन्ति पुनर्न यावत् ।
दोषाः प्रदुष्टा रुधिरं प्रपन्ना–
स्तावद्धिताहारविहारभाक् स्यात् ।। ५१ ।।

(Unmārgagā yantranipīḍanēna
svasthānamāyanti punarna yāvat ।
dōṣā: praduṣṭā rudhiraṁ prapannā-
stāvaddhitāhāravihārabhāk syāt ।।51 ।।)

The patient has to observe restrictions in diet and activities until the vitiated *dosha*s, that having been entered the blood and gone astray due to the pressure of the controlling mechanism, are returned to their original seats.

नात्युष्णशीतं लघु दीपनीयं
रक्तेऽपनीते हितमन्नपानम् ।
तदा शरीरं ह्यनवस्थितासृ–
गग्निर्विशेषादिति रक्षितव्यः ।। ५२ ।।

(Nātyuṣṇaśītaṁ laghu dīpanīyaṁ
raktēऽpanītē hitamannapānam ।
tadā śarīraṁ hyanavasthitāsṛ-
gagnirviśēṣāditi rakṣitavya: ।।52 ।।)

After bloodletting, the blood will be unsteady and the digestive power will be less. For protecting the digestive power the patient should be careful to take wholesome food and drinks that are of not too hot or cold.

प्रसन्नवर्णेन्द्रियमिन्द्रियार्था–
निच्छन्तमव्याहतपक्तृवेगम् ।
सुखान्वितं पुष्टिबलोपपन्नं
विशुद्धरक्तं पुरुषं वदन्ति ।। ५३ ।।

(Prasannavarṇēndriyamindriyārthā-
nicchantamavyāhatapaktṛvēgam ।
sukhānvitaṁ puṣṭibalōpapannaṁ
viśuddharaktaṁ puruṣaṁ vadanti (।53 ।।)

A man with pure blood is defined as one with bright complexion, clear and efficient organs, interested in sensual ends, with inherited digestive power, and enjoying comforts, with proper nutrition and strength.

इति श्रीवैद्यपतिसिंहगुप्तसूनुश्रीमद्वाग्भटविरचितायामष्टाङ्गहृदयसंहितायां सूत्रस्थाने सिराव्यधविधिर्नाम सप्तविंशोऽध्यायः।।

(Iti śrīvaidyapatisiṁhaguptasūnuśrīmad-
vāgbhaṭaviracitāyāmaṣṭāṅgahṛdayasaṁhitāyāṁ
sūtrasthānē sirāvyadhavidhirnāma sapta-
viṁśōऽdhyāya: ।।)

Thus ends the twenty-seventh chapter of *Ashtangahrdayasamhitha* titled *Siravyadha vidhi*, composed by Vagbhata, the son of Vaidyapathi Simhaguptha.

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BRONCHIAL ASTHMA AND ITS MANAGEMENT IN AYURVEDA

T. Bikshapathi* and S.N. Tripathi**

Abstract: Bronchial asthma (*tamakasvasa*) is a condition of the lungs in which there is widespread narrowing of airways. In this paper, the authors attempt to delineate the signs, symptoms and management of *tamakasvasa*, a commonest disease causing breathing difficulty.

Introduction

Bronchial asthma is characterised by variable and reversible airflow obstruction and by bronchial hyper responsiveness, an excessive airway narrowing in response to a variety of apparently unrelated stimuli. Oedema of the air wall resulting from micro vascular leakage and luminal obstruction with plasma exudation and airway secretions may also be contributory. Inflammation in the air wall has been recognised as a prominent feature of frequent asthmatic attacks.

When asthmatic patient comes in contact with allergens, the antigen and antibody reaction takes place the antigenic particles penetrate the lungs defenses and come in contact with mast cells. The histamines and substances liberated from mast cells during the allergic reactions cause changes in the bronchi then the bronchial muscles are constricted to the extent of the lessening the caliber of the bronchi, mucus membrane of the bronchi gets swollen, which further restricts the lumen of the bronchi. Secretions are poured out from the swollen mucus lining into the constricted lumen of the bronchi. When the bronchi constricted and they are full of secretions, the breathing becomes difficult with a wheezing sound, which is more while breathing out. The description of *tamakasvasa* in ayurvedic classics closely resembles to the clinical features of bronchial asthma. The word *svasa* is derived from the root *svas jivane* which means life processes are inhalation and exhalation of air during breathing.

Classification of *svasaroga*

The disease *svasa* has been classified under five headings in ayurveda i.e. 1. *kshudrasvasa* 2. *tamakasvasa* 3. *chinnasvasa* 4. *mahasvasa* and 5. *urdhvasvasa*. Among these, *tamaka svasa* is mentioned here in detail.

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Tamakasvasa

According to Charaka, the provoked *vata,* by various aetiological factors, enters into *pranavahasrotas* and deranges the *kapha* in chest (*uras*) and produce obstruction of *pranavayu* causing *svasa*. It has been described that dyspnoea is caused by the obstruction in the free flow of *vayu* inside *pranavahasrotas*. Vagbhata also emphasizes that *amasaya* is involved in the pathogenesis of the *tamakasvasa*. In this condition, increased movement of provoked *vayudosha* occurs due to the obstruction in *pranavahasrotas*, this result in the *peenasa,* which is one of the important symptoms usually present in *tamakasvasa*.

Severe attack of asthma is very agonizing and life becomes miserable. Patient feels thirsty and while coughing persistently as if entering into the dark and gets fainted frequently. Expectoration is only scanty and as long as the sputum is not expelled, the discomfort increases and expectoration gives temporary relief. As a result of obstruction of airways, the patient can speaks only with great difficulty and he does not get proper sleep due to orthopnoea, for in lying position, *vayu* is further obstructed.

The disease gets further worsened during rains, clouds, cold winds, and due to other *kapha*-provoking factors. The *tamakasvasa* is curable only if it is in the initial stage[1], the patient develops tendency of spitting and vomiting and becomes weaker during paroxysmal attacks[2]. Vagbhata describes that in addition during the attack patient may also develop tremors[3]. While deals with *tamakasvasa*, Charaka describes two allied conditions - *pratamaka* and *santamaka svasa*. Susruta and Vagbhata describe *pratamakasvasa* only, which includes in the clinical manifestation of *santamakasvasa*.

Pratamakasvasa: - In this condition fever and bouts of fainting are the associated symptoms in-addition to those of *tamakasvasa.* According to Charaka, *kapha* and *vata* are the predominant *dosha*s in *tamakasvasa* and *pitta* also vitiates in *pratamakasvasa* causing fever. The bronchial asthma with super imposed infection can also produce the clinical features of *pratamakasvasa*. It can also be observed in acute bronchitis.

*Santamakasvasa***: -** In this condition *svasa* is aggravated during the night and contrary to *tamakasvasa,* the patient feels relief with cold, some times as if drowning in the sea of darkness; this leads to the nomenclature of this condition as *santamakasvasa*. The patients of bronchial asthma developing cor pulmonale and emphysema or cardiac asthma may have such picture of *santamakasvasa*.

Aetiology

Charaka describes certain *ahara vihara* conditions and environmental factors causing *svasaroga* as follows[4].

Ahara: - Foods that are heavy (*guru*), irritant (*vidahi*), *kapha* producing (*abishyandi*), slow digestive (*vistambi*) and dry and malnutrition (*rooksha*), etc. are causing to induce *svasaroga*.

Vihara: - excessive exercise (*ativyayama*), excessive walking (*adhva*), excessive sexual intercourses (*ativyavaya*), emaciation (*atiapatarpana*), cold season (*seetakala*), use of cold water (*seetajala*), etc. are the aetiological factors of *svasaroga.*

Diseases: - Certain diseases specifically gastro

intestinal tract disturbances like diarrhoea (*atisaram*), vomiting (*chhardi*), partial obstruction (*udavarta*), endotoxins (*ama-dosha*), etc. may produce *svasaroga*. Other conditions like rhinitis (*pratisyaya*), fever (*jvara*), hemorrhagia (*raktapitta*), anaemia (*pandu*), debility (*dourbalya*) and involvement of vital organs (*marmaghata*) may also cause *svasaroga*.

Environmental factors: Dust (*raja*), smoke (*dhuma*) and sudden changes in the climate may precipitate the attacks of *svasaroga*. Dust and smoke indicates inhalant allergens and which causes of bronchial asthma; changes in temperature according to climate may also precipitate asthmatic attacks.

It is a fact that stomach and lungs are developed from the same rudiment which is a pocket like invagination of endodermal epithilium and only due to the process of development that two organs are lodged into two cavities, in the adult life both of them have identical physiological and pharmacological reactions, for instance the emetics simultaneously stimulate the bronchial mucosa causing expectorations in addition to its usual irritation at the level of the gastric mucosa. Similarly some expectorants in high doses produce emesis. Both of the stomach and lungs have histamine receptors and mucus glands in excess. In pathological conditions as well they behave in similar fashion. It is reported that the patients of bronchial asthma do suffer from achlorhydria and hypochlorhydria.

It is a possibility that allergens excreted by gastro-intestinal fluid do play a role in sensitization of the organism and for development of allergic asthmatic symptoms. The occurrence of the late asthmatic symptoms observed in some patients after intranasal challenge with pollen grain goes in favour of this assumption (Wilson et al. 1973).

So, the pathogenesis of the *svasaroga* in ayurveda and bronchial asthma in modern medicine are very close to each other.

Premonitory symptoms (*poorvaroopa*)

According to Charaka, there are three types of *poorvaroopa*s i.e. 1. short and shallow breathing (*pranavilomata*), 2. chest pain (*parsva-soola*) and 3. flatulence (*anaha*)[5]. While Susruta describes aversion towards food (*bhakta-dvesha*), bad taste in mouth (*virasya*), restlessness (*arati*), as additional symptoms of *poorvaroopa* of *tamakasvasa*[6], Vagbhata adds headache (*sirorujam*) to the above lists[7].

Clinical features

Charaka categorizes the clinical features of *tamakasvasa* into three i.e. 1. Features related to respiratory system, 2. Constitutional features and 3. Miscellaneous features or features having *upasaya* and *anupasaya* relation with *tamakasvasa* (Table 1)

Prognosis (*sadyasadyata*)

The prognosis of these types of *svasaroga* is not facile. Almost all ayurvedic scholars opine that *tamakasvasa* is curable if the patient is having good health and bodily strength (*pravarasatva*) enough to tolerate the *sodhanakarma* (*vamana* and *virechana*) and if the disease is of recent origin; chronic cases are manageable, not curable.

Line of treatment (*chikitsasutra*)

On the *dosha* ground, the patients of *tamakasvasa* are divided into two groups specifically with predominance of *vatadosha* and *kaphadosha*; and again, on the basis of the bodily strength they are classified into two i.e. good and poor bodily built.

TABLE 1
Clinical features of *tamakasvasa*

a. **Features related to respiratory system**

1. *Peenasa* (coryza)
2. *Kasa* (cough)
3. *Teevrasvasa* (rapid respiration)
4. *Pratiloma vayu* (prolong expiration)
5. *Pranaprapeedaka svasa* (severe dyspnoea)
6. *Greeva sira sangraha* (ingurged neck veins)
7. *Kasajanyapramoha* (fainting while coughing)
8. *Sleshma amuchya janya dukhah* (distress due to inability to expectorate)
9. *Sleshma vimoksha janya sukha* (relief with expectoration)
10. *Kriccha sleshma shteevana* (difficult expectoration)
11. *Ghur ghurka dvani* (wheezings)
12. *Muhuh svasa muhuh abdhamyate* (status asthamaticus)
13. *Kriccha bhashana* (difficulty in speaking)
14. *Kantodhvasana* (laryngitis)
15. *Shyana parshva avagrahana* (pressure on both sides of chest or tightness of the chest)
16. *Sayana svasa peeditha* (difficulty in breathing in laying position)
17. *Aseeno labhate saukkyam* (orthopnoea)
18. *Anna dusti* (disinclination towards food)
19. *Vamathutrayah* (tendency of spitting & vomiting)
20. *Sputamaka peedeeta* (usually attack comes in night)

b. **Constitutional features**

1. *Bhrishama arate* (severe discomfort)
2. *Nidra alabha* (insomnia)
3. *Lalata sveda* (sweating on fore head)
4. *Uchhirta akshi* (wise open eyes)
5. *Vishushkasya* (dryness of mouth)
6. *Pratanyata* (forward bending)

c. **Miscellaneous features or features having *upashaya* and *anupashaya* relation with *tamakasvasa***

1. *Ushna upashya* (relief by taking hot things)
2. *Meghai abhivardata* (precipitated by clouds in sky)
3. *Ambuna abhivardate* (precipitated by rains)
4. *Sheeta vataih abhivardhate* (precipitated by cold waves)
5. *Pragvatah abhivardhate* (precipitated by easterly winds)
6. *Sleshmalaish abhivardhate* (precipitated by *kapha*-increasing measures)

Sodhanakarma (*vamana* and *virechana*) are suitable for the patient of good body built with predominance of *kapha*, while the patient of poor body built and having predominance of *vata* should only treated with medicines (*samana*), nourishing diet along with the drugs having alleviative property for *vata*. The old people and children should also keep the same regimen[8]. The bronchial asthma patient should use nourishing diet, for the maintenance of *rogibala*

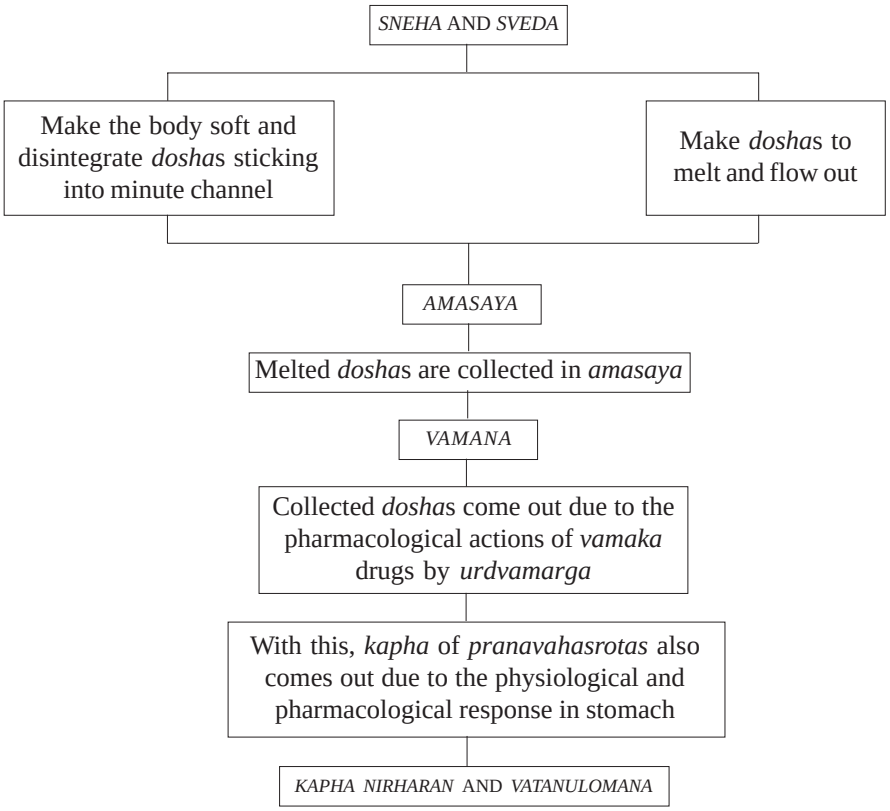
***Sodhana* therapy**

If the patient is of strong enough and with predominance of *kapha*, *vamana* (vomiting) and *virechana* (purging) are advised, otherwise palliative treatment is advocated. Recent studies show that *vamana* is very effective in bronchial asthma (Sachdev, Tripathi S.N. 1987). (Fig. I)

Generally, while prescribing *sodhana* therapies, *vamana* and *virechana* are suggested; *vasti* and *nasya* are contraindicated as it would

Fig. I

Mechanism of *snehana*, *svedana* and *vamana* in bronchial asthma



produce *udavarta* and irritate bronchos and produces spasm. However, in some cases *nasya* is seen advised. In *snehapana, Kantakari ghrita, Vasaghrita, Pippali ghrita,* etc. are given; these stimulate *agni* and subsides *kapha*. Intake of *Indravarunichurnam* and *Pippalichurnam* (1g each) twice a day with hot water is advised for *virechana*; or, 1g each of *aragvadha, haritaki* and *draksha* twice daily with hot water is recommended. For *pittavirechana,* 2 tabs of *Arogyavardhini* thrice daily should be given.

***Samsamana* therapy**

For the management of *svasaroga* Charaka mentions ten drugs under *Svasahara kashaya*[9]. Susruta also describes 25 drugs for the treatment of *svasaroga* in *vidharigandhadi varga*[10]. *Surasadigana* and *Dasamula gana* have also been stated for the treatment of *svasaroga*[11].

General prescription

The commonly used drugs in *tamakasvasa* are detailed in Table 2. In acute condition, inhalation (*dhumapana*) of the medicated fumes, burnt with *kushtha* (*Saussurea lappa*) and *kantakari* (*Solanum surattense*) or by fumigation of a mixture of tea leaves, *datura* (*Datura metal*) leaves and Potassium nitrate are advised. By doing so the medicated smoke goes to the bronchial level and dilates bronchi. Massaging with warmed mustard oil mixed with *saindhava* (rock salt) on the chest for 10 to 20 minutes followed with fomentation is recommended as local treatment. This serves as a broncho-dilating action.

Medicines

The following medicines are generally advised:

a. *Hinguadivati* - 2 pills with hot water (this normalizes *urdvavata*)
b. *Kanakasava* and *Vasarishta* (both 20ml) with lukewarm water in every 6 hour
c. *Lavanabhaskarachurna* - (4 to 6g) with hot water once in a day (it normalizes the *apanavayu*)
d. *Karaveeradi vatika* (1g) and *Svasakutar rasa* (250 mg) with betel leaves
e. *Kanakasava* (20ml), *Lavanabhaskara* (3g) mixed with 20ml of water after lunch and dinner
f. *Kupilu Hingvadi* or *Hingvadi vatika* (2 tabs) twice a day
g. *Yashtyadi churnam* (3g) at bed time or *Arogyavardhini* (2g) twice a day
h. *Haridrakhandam* (2 table spoon) twice daily
i. *Sirishadi kvatha* (20ml) twice daily

Other formulations

a. *Mahasvasadiloha* (500mg) or *Svasa-chintamani* (250mg)
b. *Dasamoolarishta* (20 ml), *Kumaryasava* (20 ml) and *Lavanabhaskara* (3g) with hot water in divided doses after meals
c. *Karaveeradiyoga vatika* with *tambula patra* (This acts as a cardiac stimulant like digitalis)
a. 500mg each of *Svasakuthara rasa, Sringa-rabra rasa, Chandramrita rasa, Pravala* and *Talisadichurnam* twice daily with hot water is prescribed in sub acute stage.

The following medicines are recommended to take frequently:

Kharjuradi leham i.e. 2g each of dates, butter, and sugar given frequently liquefies *kapha*, promotes strength and serve the purpose of *rasayana*. If the patient is suffering from cough with spasm intake of *Chyavanprasam* (20g),

Talisadichurna (10g) and *Madhu* (50g) in divided doses twice a day is effective. In Eosinophilia, 250mg *Rasamanikya rasa* or 500mg *Mallasindoor* or 250mg *Sameera pannaga* and 1 table spoon *Manasiladighrita* twice daily is effective.

Prepare a tea-like combination with equal parts of *Haridrakhand ksheerapaka vidhi* or 1 to 2 cloves *Pippali* and Brancho tab i.e. powdered *sirisha, kantakari, yashtimadhu* and *vasa*. This is very useful remedy in bronchial asthma. It also acts as a good broncho dilator. 1 to 4 leaves of *anantamoola patra* (*Tylophora indica*) chewed and swallowed with hot water in the early morning makes nausea and vomiting; after *vamana,* inhaling *dhumavarti* is very effective.

Management of the patient

In acute attack, the line of treatments is - 1. removal of the *svasavarodha* (obstruction of respiratory passage) by eliminating the *kapha* and 2. *srotosuddi* i.e. to remove the broncho constriction caused by *vata*. According to Charaka and Vagbhata, the *kapha* should be

TABLE 2

Commonly used drugs and medicines in *tamakasvasa*

a. Drugs:

Sirisha (*Albizia lebbeck*), *kutki* (*Picrorhiza kurroa*), *vasa* (*Adhatoda vasica*), *madhuyasti* (*Glycyrrhiza glabra*), *Haridra* (*Curcuma longa*), *kantakari (Solanum surattense*), *shati* (*Hedychium spicatum*), *lasuna* (*Allium sativum*), *pushkaramula* (*Inula racemosa*), *tulasi* (*Ocimum sanctum*), *datura* (*Datura stramonium*), *agaru* (*Aquilaria agallocha*), *bharangi* (*Clerodendrum serratum*), *dugdhika* (*Euphorbia hirta*), *vacha* (*Acorus calamus*), *vibhitaki* (*Terminalia bellirica*), *aristamanjari* (*Acalypha indica*), *palandu* (*Allium cepa*), *ghritakumari* (*Aloe*), *pippali* (*Piper longum*), *svasagni* (*Tylophora indica*), *arka* (*Calotropis procera*), *somalata* (*Ephedra*).

b. *Kashaya*s (decoctions):
Vasadikashaya, Sirishadikashaya, Pushkaramuladikashaya and *Sathyadikashaya.*

c. *Gutika - Lavangadivati*

d. *Avaleha*s:
Vasavaleha, Vyaghri Haritaki, Haridrakhandam and *Chyavanprasam*

e. *Ghrita*s:
Vasaghritam and *Manahsiladighritam,*

f. *Rasaushadha*s:
Svasakutara ras, Svasakasa chintamani ras, Svasabhairava ras, Chandramrita ras and *Svasachintamani ras*

g. *Churna*s:
Talisadi churnam, Sitopaladi churnam, Katphaladi churnam, Vasa churnam, Ajamodadi churnam, Pushkaramuladi churnam and *Sathyadi churnam.*

liquefied first by massaging medicated oils and *saindhava* (rock salt) all over the chest. After this, patient should be given the drugs and diet, which have the property of *kapha vriddikara dravya* (mucolysis) so that the obstructing *kapha* can easily be expectorated out.

Indications (*pathya*)

Sarshapataila (mustard oil), *puranaguda* (old jaggery), spicy food, soup, *chapatti*, vegetable curries, etc. should be included in the diet. Tea, coffee and dry fruits like *acrot*, *kharjoor* can also be taken. Exercises like *pranayama*, *asana*, etc. will enhance the lungs power.

Contraindications (*apathya*)

Asthma patient should not take food items such as *lassi*, *sarbat*, rice, sour-fruits, ice, beer, cool drinks, green-piece, egg, meat, fish, groundnuts, etc. Do not take food prior to the digestion of earlier food. Care should be taken to avoid exposing to cold, smoke, dust, polluted environment; and excessive exercises, over indulgence in sex, excessive walking, day time sleep, etc. also are to be avoided.

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EFFECTIVE WOUND HEALING FORMULATIONS OF AYURVEDA AND THEIR PHARMACEUTICAL STANDARDISATION

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Abstract: A vast number of formulations have been mentioned in ayurvedic literatures for the purpose of wound healing. This paper presents some formulations, their processing techniques, mode of application, etc.

Introduction

Wound is a forcible break of continuity of soft tissues due to any violence. Healing is the response of body to an injury in an attempt to restore the normal structure and function. The etiological factors of wound formation include mechanical injury, chemical injury, radiant injury, etc. The wounds are broadly classified into two types i.e. open and closed.

Necessity of healing

Any break in the surface of body skin and mucous membrane exposes the deeper tissues to be danger of infection. Therefore it is necessary to assist the healing process of body to restore an intact surface as soon as possible. The process of healing is fundamentally the same in all wounds, but there are marked quantitative differences depending on the amount of tissue destruction and to certain extent on the presence of sepsis. The biological process of wound healing includes three phases i.e. Inflammation, Proliferation and Differentiation (Table 1). The process of wound healing depends on some factors i.e. general factors and local factors[1]. *Vrana* is a state of tissue destruction and after healing it leaves a scar which persists throughout the life time[2].

Management

Sapta and *shasti upakramas* have been mentioned in ayurvedic classics for the management of *vrana*[3,4]. Out of these, *sodhana* and *ropana* play a vital role in quick and perfect healing. If any deformities remain after healing *vaikritapaham* treatment is done for it, which includes *lomasatana, lomasanjanana, savarnikarana, krishnikarana,* etc[5].

A number of herbal, mineral and animal materials and their combinations effective in wound healing are mentioned in ayurvedic literatures; few of them are categorized and presented in Table 2. For the manufacturing of various formulations, combinations of few desired materials in appropriate amounts and application of specific processing techniques are essential (Table 3).

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TABLE 1

Biological process and factors influencing wound healing

Etiological factors of wound formation	Classification of wounds	Biological Process of wound Healing	Factors influencing wound healing
• Mechanical injury (open, closed) • Chemical injury: Strong acids and alkalies Insect bite Snake bite Bhallatak • Radiant injury: Heat X-ray Electricity Radium	• Closed: Contusion Haematoma • Open: Incised Lacerated Punctured Penetrating Perforating Abrasion Contaminated Infected	• Phase of inflammation: (1-4 days) characterised by heat, redness, tenderness, swelling, loss of function. • Phase of proliferation: (5-20 days) with granulation tissue formation. • Phase of differentiation: (from 20 days) with scar tissue formation.	• General: Age, malnutrition, vitamin deficiency (C,D,A), trace metal deficiency (Zn, Cu, Ca, Mn), anaemia, malignant diseases, uraemia, jaundice, diabetes, generalized infections, cytotoxic drugs, steroids. • Local: Tissue tension, haematoma, necrotic tissue, local inflammation, foreign body, poor blood supply, recurrent trauma, local irradiation, faulty techniques of wound closure.

TABLE 2

Various raw materials used for wound healing

Herbal:

Triphala, nimba, panchavalkala, panchatikta, salsaradigana, kakolyadigana, nyagrodhadigana, asvagandha, satavari, sariva, raal, kiratatikta, snuhi, apamarga, palasa, yastimadhu, karanja, karaveera, devadaru, sarala, lodhra, agaru, jati, peelu, chandana, katuki, arka, etc.

Mineral:

Svarna, rajata, tamra, loha, mandoora, yasada, naga, vanga, makshika, abhraka, kasisa, tanka, sphatika, tutha, hartala, manassila, khatika, mrittika, lavana, jahar-mohar, dugdha pashana, hingula, etc.

Animal:

Madhu, ghrita, ksheera, gorochana, kasturi, sankha, mukta, pravala, sukti, varatika, tvak, roma, khura, asthi, sringa, vasa, majja, etc.

General principles of standardisation

1. For obtaining standard products starting with genuine and standard raw materials and processing through standard processing techniques are essential. To establish their standard, various physico-chemical testing parameters can be applied.

2. The standardisation of raw materials includes pharmacognostical identification techniques and selection of fresh and mature plants with active principles. In mineral materials, identification and selection is done as per characteristics described in *Rasa tantra*s.

3. Heating. boiling, quenching, washing. filtering, grinding, disintegrating. sieving, roasting, mixing, churning, distillation, extraction etc. are the various pharmaceutical procedures involved in drug manufacturing. Application of above procedures in a specific manner i.e. particular duration of time and heating pattern, specific equipments, vessels and containers are essential to facilitate proper processing.

4. At the time of processing various control parameters like *ghrite phenasanti / taile phenodgama* in *snehapaka*, *nischandratva*, *varitaratra*, etc. for *bhasma*s should be applied to obtain standard products.

5. For the evaluation of the standards of final products, application of various physico-chemical analytical parameters are also essential.

TABLE 3

Various pharmaceutical processing techniques involved in various formulations

Sl. No	Product	Techniques applied
1.	*Kalka*	Crushing and grinding
2.	*Kvatha*	Boiling and evaporating
3.	*Churna*	Grinding, disintegrating and sieving
4.	*Satadhautaghrita* *Sarjarasa malahara* *Atasyadilepa*	Washing with churning
5.	*Malahara*	Uniformly mixing with *Siktha taila*
6.	*Ghrita* / *taila*	Boiling with *sneha, kalka, drava* and complete evaporation of water
7.	*Drava*	Dissolving
8.	*Triphala guggulu*	Boiling, filtering, dehydrating, mixing and pill making
9.	*Mashi*	Firing in a closed (air tight) container
10.	*Drusti*	Heating, melting in oil.
11.	*Bhasma*	*Sodhanam*, *bhavana* and *putapkam*
12.	*Svarna Vasanta Malati rasa* *Vasanta Kusumakara rasa* *Arogya vardhini vati*	*Bhavana* (Trituration with liquid) & pill making

6. The pharmaceutical and therapeutic standards of the final product can be evaluated by subjecting it to experimental and clinical trials.

Mode of application

For the purpose of *sodhana, ropana* and *vaikritapaham* the above drugs are applied both externally and internally.

Bhasmas, *pisti, vati, gutika, avaleha, asavarista*, etc. are used for internal purposes whereas *kalka, kvatha, churna, ghrita, taila*, etc. are used both internally and externally. *Malahara, lepa, kshara, varti, dhuma, mashi, rasakriya, drava*, etc. are useful for external purpose only (Table 4)

Mode of action

- The *sodhana dravya*s remove the necrotic slough tissue and clean the surface of wound.
- *Ropana dravya*s stimulate granulation tissue formation, which facilitates rapid healing.

TABLE 4

Classification of products effective in wound healing

Sodhana	*Ropana*	*Vaikritapaham*
1. *Kvatha*: *Nimbapatra, panchvalkala, tripbala, manjistha, karveeramula tvak.*	Internal use:	1. *Bhallataka, Snuhi ksheeram*
2. *Kshara*: *Snuhi, palasa, apamarga.*	1. *Kvatha*: *Manjishthadi, Panchatikta*	2. *Rasanjanam*
3. *Taila/ghrita*: *Kasisadi, Jatyadi*	2. *Kiratatiktadi seeta kashaya*	3. *Jala sukti, Sphatika churna*
4. *Kalka/Varti*: *Indravaruni, langali, ela, vidanga, karanja, yavkshara, chitraka, manassila,* etc.	3. *Saribadyarishta*	4. *Haratala / Manassiladi yoga*
5. *Churna*: *Kasisa, saindhava, surabeeja, haridra, daruharidra,* etc.	4. *Triphala guggulu*	5. *Mashi*: *Hastidanta, tvak, roma, khura, sringa, asthi.*
6. *Rasakriya* : *Salsaradigana, triphala, patola,* etc.	5. *Arogyavardhini vati*	6. *Kasisa, Amalatas, Kapittha.*
7. *Dhuma*: *Chandana, raal, sarala, devadaru,* etc.	6. *Vasanta kusumakar rasa*	7. *Kukkutanda, Kapal. Katak, Madhuka*
8. *Drava*: *Sphatika, tankana, tuttha.*	7. *Swarna vasanta malati rasa*	8. *Haritaki, Katutumbi, Mrittika- kharpara, Sarjarasa*
	8. *Bhasmas* of *svarna, rajata, tamra, loha, mandoora, abhraka, yasada*	9. *Taila*: *Kasisadi, Somraji, Bhallataka*
	External use:	10. *Malahara*: *Tankan, Tutthamrit, Kampillaka*
	1. *Kalka*: *Nimba tvak, tila* with *madhu*	
	2. *Ghana*: *Haridra, daruharidra*	
	3. *Madhu ghrita karpura yoga.*	
	4. *Satadhouta ghrita*	
	5. *Taila/Ghrita: Raal, Panchguna, Nimba, Tuvaraka, Jatyadi, Peelu.*	
	6. *Gandhaka druti/malahara*	
	7. *Malahara*: *Yasadamritarita, Sindooradi, Kajjalikadya*	

- *Bhasma*s of *lauha, mandura, yasada, tamra, pravala,* etc. supplement deficiency of essential trace elements, which play a vital role in wound healing.
- *Churna*s of various herbal drugs supplement the deficiency of vitamins, proteins and calcium which play a key role in wound healing and also remove the imbalance of *dosha*s.
- *Savarnikarana, krishnikarana, lomashatana, lomasanjanana* are the important processes of *vaikritapaham*.
- Preparations containing *ballataka, somaraji, kasisa,* etc. stimulate the pigmentation process thus discolouration can be removed[6].
- Application of *hastidantamashi* stimulates the growth of hair, other than this the *mashi* of skin, nail, bones and heel of various animals are also recognised for *lomasanjanana* purposes[7].

Haratala, manassila, shankha churna, kanji, etc. help in removing unwanted hair (*lomashatana*) which hinders the process of healing[8].

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THE EFFECT OF *MOMORDICA CHARANTIA* SEED ON RAT SPERMATOZOA - A SCANNING ELECTRON MICROSCOPIC STUDY

M.M. Girni, R. Nazeer Ahmed and Mukthar Ahmed*

Abstract: Scanning Electron Microscopic (SEM) studies on the effect of treatment with alcohol extract of *Momordica charantia* seeds to male albino rats at a dose of 25 mg/100g body weight orally for 35 days on the cauda epididymal sperms indicated that plasma membrane and acrosomal membrane are disturbed with serrations in the sperm head region. Considerable change in the shape and size of sperm head is observed. Morphologically most of the sperms exhibited abnormality. There was appearance of cytoplasmic droplets in the mid tail region.

Introduction

Search for safe and effective oral drugs for control of human fertility due to increasing population pressure world over, particularly in the developing countries, is the need of the day. Various plants and their parts have been reported to possess anti-fertility and anti-spermatogenic activities.

The leaf extracts of *Vinca rosea* is anti-spermatogenic and affects the motility in rats, *Azadirachta indica*, *Beaumonia grandiflora* and *Cordia dichotoma* reduce the weight of testis, accessory reproductive organ and affect the libido in rats. Similarly, leaves of *Artobotrys odoratissimus*, *Plumaria alba*, *Ocimum sanctum*, *Butea frondosa*, *Hibiscus rosa - sinunsis*, seeds of *Carica papaya*, shoots of *Bambusa arunndinacea* aqueous and crude extracts of *Echeveria gibbiflora* cause anti-fertility and anti androgenic effect in rats, mice and guinea pigs etc.

Momordica charantia belongs to the family Cucurbitaceae and is seen throughout India. Its fruits are generally used as vegetable. The fruits and seeds are violent cathartics and hydragogues[1]. The plant possesses many medicinal properties effectual in many diseases such as diabetes, eczema, oedema, etc[2]. Its root decoction is mentioned as an abortifacient in ayurvedic texts. Literature review indicates that its fruits have anti-spermatogenic activity in dogs[3]. The administration of petroleum ether, benzene and alcohol extracts of its seeds showed reduction and inhibition in weight of testis in spermatogenesis, as the number of spermatogonia, spermatocytes and spermatids was decreased. The number of spermatozoa counted

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from cauda epididymis decreased markedly and also showed deformation in structure in all types of extracts[4]. In immature rats these extracts showed decrease in the weight of epididymis, vas deference, seminal vesicle and prostate[5].

Review of literature showed the paucity of information about the SEM observations on the effect of *Momordica charantia* in albino rats. Hence, the study was designed to investigate the morphological changes in the rat cauda epididymal sperms induced by alcohol extract of seeds.

Materials and methods

The seeds were dried, powdered coarsely and subjected to soxheltation process to obtain the alcohol extract. Colony bred Wistar strain albino rats weighing 190-210g of proven fertility were given food and water *ad libitum* and kept in uniform animal husbandry conditions. Two groups of 5 animals each were made Group I received 1 ml of 2000 ppm Tween - 80 orally and served as Control. Group II received 25 mg /100 gm body weight alcohol extract seeds orally (gavage).

The animals were autopsied 24 hrs after the last dose. A drop of cauda epididymal plasma was fixed in 2% gluteraldehyde, centrifuged and washed with 0.1 M Sodium cacodylate buffer (pH = 7.2), centrifuged again in doubly distilled water till the buffer solution washed out and a thin film was applied on a cover slip, dried, sputter coated with gold and finally observed under scanning electron microscope.

Results

The cauda epididymal sperms of control rats appeared normal under SEM (Fig. 1-A). Spermatozoa from the treated rats (group II) showed morphological abnormalities such as plasma membrane disruption as well as acrosomal membrane. The acrosome is swelled / bulged. The mid region of sperm head is constricted. There was appearance of balloon like cytoplasmic droplet in the mid tail region (Fig 1 B-E).

Discussion

Studies involving hypophysectomy, castration and androgen replacement therapy reveals that androgen is essential for physiological maturation of spermatozoa in epididymis[6,7]. The principle attributes of sperm are motility and fertilizing ability, which are prerequisites for fertilization. Any negative impact on motility would seriously affect the fertilizing ability[8]. The occurrence of morphologically abnormal sperms is a diagnostic aid for infertility[9].

Caudal region of epididymis appears to be the most favourable site for survival of spermatozoa[10]. A number of synthetic and plant derived estrogenic substances have been reported to be good inhibitors of male fertility and affect the androgen dependent organs[11]. The combination of medroxyprogesterone acetate + testosterone enanthate (M.P.A + T.E) is a contraceptive having anti-spermatogenic action in males including human beings at testicular level[12] and loss of sperm motility and structural defects exhibited by steroid administration is well known by changing their membrane permeability in monkey epididymis[13]. The morphological changes of spermatozoa as evidenced by SEM study revealed the loss of acrosomal content or loss of sperm acrosome in rats. Hence, these sperms were probably unable to fertilize the ovum[14].

Enzymes containing in the acrosome and those destined for acrosome, which are secreted by

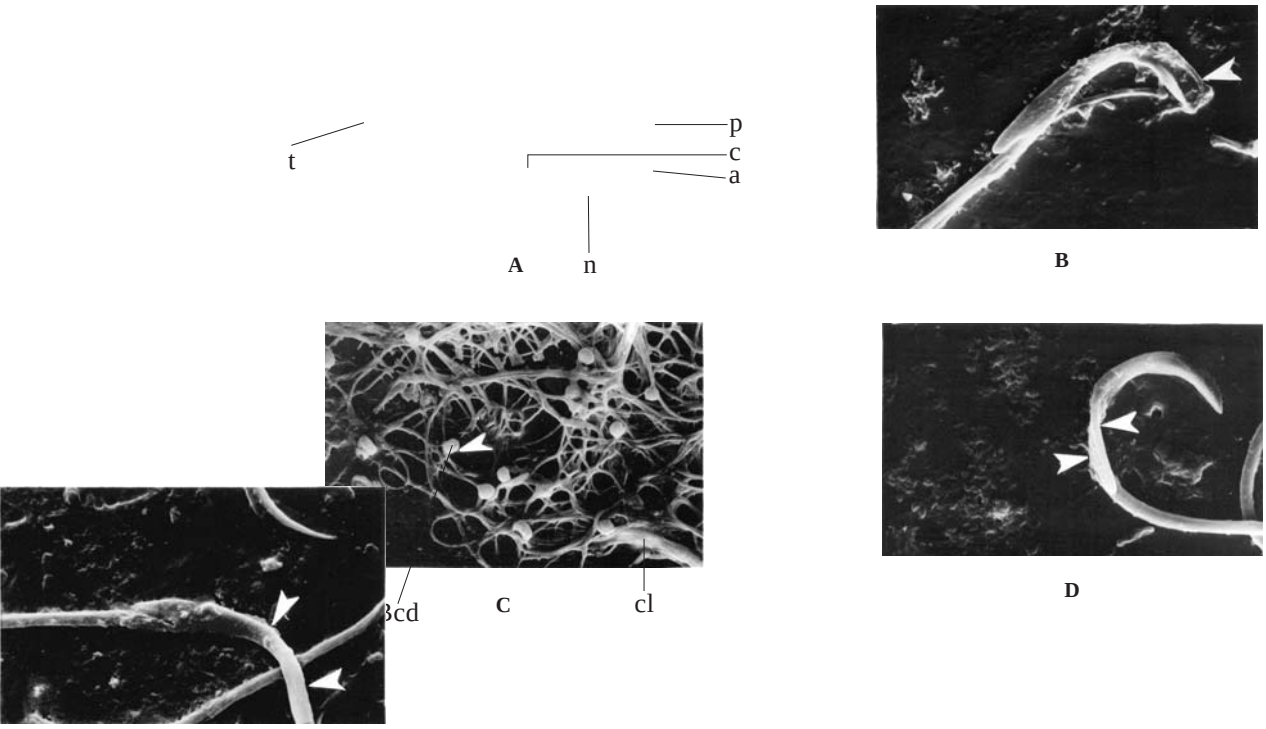

Fig. I

Scanning electron micrographs showing the cauda epididymal sperm morphology of normal and treated (25 mg/100 gm body weight of *Momordica charantia* seed extract) albino rats.

A) Normal spermatozoa of albino rat with characteristic sickle shaped head 4.56 Kx
B) Micrograph of sperm showing complete disruption of plasma membrane throughout the head region (arrow) 5.00 Kx. **C**) Baloon-like cytoplasmic droplets in the tail region are seen long with clumping (arrow) 5.00 Kx. **D**) Spermatozoa head showing wrinkled features 4.72 Kx.
E) Electron micrograph of sperm showing disruption of membrane and severe effect at the anterior region of the head (arrow) 5.00 Kx.

t. Tail region **p**. Perforatorium **c**. Post nuclear cap **a**. Acrosome **n**. Nucleus
Bcd. Balloon-like cytoplasmic droplet **cl**. Clumping

Golgi complex and endoplasmic reticulum are regulated to some extent by testosterone[15]. Histochemical evidences indicate the presence of carbohydrates I polysaccharides in the acrosome of sperm head which are associated with various enzymatic activities[16-18].

Gossypol from cottonseed extract affects the development of sperm nucleus and acrosome in rats[19]. Alcoholic extract of *Solanum xanthocarpum* seeds affect the sperm morphology that showing decapitation, acrosomal damage and mid piece abnormality[20]. Aqueous and chloroform extracts of *Carica papaya* seeds cause sperm abnormalities and retention of cytoplasmic droplet resulting in complete inhibition of fertility in rats and mice. It is observed that the extracts cause androgen-deprived effects to target organs resulting in alteration of the internal milieu of cauda epididymis.

Recent studies show that aqueous crude extracts of *Echeveria gibbiflora* on guinea pig sperm results in the formation of huge bubble by distension of plasma membrane, dispersion of acrosome content.

The study of albino rat sperms from cauda epididymis treated with an alcohol extract of *Momordica charantia* seeds by Scanning Electron Microscope reveals considerable changes in the size and shape of the sperm head, disruption of the plasma membrane and acrosomal membrane specifically at the anterior region. The mid region of sperm head shows dorsoventral constriction. The sub acrosomal material swells / bulges, probably due to the general disturbance in the proteins and in the surface coating of outer acrosomal membrane. Most of the sperms show abnormalities morphologically such as clumping of tails, plasma membrane disturbance throughout the head region and detached sperm heads. The mid region of the tail shows balloon like cytoplasmic droplets. These observations are similar to that caused by MP A + TE treatment[21] *Carica papaya* seed extract[14], leaf extract of *Azardirachta indica*[42], and benzene extract of *Ocimum sanctum*[22]. However the conclusions are based upon a preliminary study where the rats are force fed with the extract of *Momordica charantia* seeds. Further studies are in progress.

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IMPOTENCY
(Part - IV)

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Abstract: Continued from the previous issue. This part contains the clinical evaluation of impotent patients and the actual line of treatment for different types of impotency.

EVALUATION OF PATIENT

Now a days, a number of sophisticated techniques have been developed to obtain a specific diagnosis. As the aetiology is multifactorial, a proper assessment shall provide a probable etiology so that one can rationally formulate an appropriate clinical approach.

Ayurveda has adopted its own methods to evaluate the subject. Ayurvedic treatments are person-specific rather than disorder-specific, and thus a thorough personal examination based on the ayurvedic principles is of value. The examination of patient should be done by *darsana*, *sparsana* and *prasna pareekshas* also, with the aid of *prakrityadi dasavidha pareeksha* mentioned in *Charakasamhita*.

Vikruktipareeksha

This is an evaluation of the disease encompassing the *hetus* (causes), *lakshana* (sign and symptom), *dosha*, *dushya* etc. Grading of the functioning of *apanavayu* should be attempted. In case of *sukradushti*, it should be noted whether it limits only with *sukrakshaya* and the *sukravahasrotodushti*. Hormonal assay is required to know the status of androgens. Past operations (*sastrakarma* is a *nidana* of *sukravaha'srotodushti*) and the drugs that the patient is taking should be asked.

Prakritipareeksha

Prakriti of the patient is important in this context because, among the *prakriti*, *vata*-dominant *prakriti* is more susceptible for developing and worsening impotency, also bad prognosis. Moreover their sexual relation will not be satisfactory, leading to marital disharmony. *Kapha prakriti* is having the maximum virile and fertile power whereas *pitta* is in between.

Satvapareeksha

Satvamuchyate mana – Here, *satva* means psyche; this may be *pravara*, *madhyama* or *avara*. The assessment is made after the necessary queries to the patient or to a member who is close to the patient. In a *heenasatva*, there is higher chance of a psychic link. For *pravarasatva*, there is least chance of pure psychogenic causation.

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Satmyapareeksha

Queries of the diet preferred. A *ruksha* and *pittavardhaka* diet may lead to serious ailments like *kshayajanya klaibya, pittaja klaibya,* etc. This factor is dependent on many others like *prakriti, bala,* etc. of the patient. The *agnibala* and *dehabala* are of prime concern.

Aharasaktipareeksha

Aharasakti directly indicates the *agnibala* of the patient, and when it is proper it bestows *dehabala*; disorders of it directly indicate an associated affection of *annavaha srotus,* that may be capable to lead to *rasadi dhatukshaya*.

Vyayama saktipareeksha

Vyayamasakti is the direct indicator of *dehabala.* It should be graded to make the proper assessment. Even with proper *dehabala* and *vyayamasakti,* sometimes patients complain of difficulty in maintaining erection. Then suitable investigation should be done whether there is decreased blood flow to the penis especially during movement.

Vayahpareeksha

Though aging is not an inevitable cause, it affects sexual power adversely in most of the cases.

Samhananapareersha

Samhanana is *samyojana* - body constitution. Examination of *samhanana* comprises any disproportion or abnormal finding of the body structure. It includes the physical examination of genitals which may lead to diagnosis of *medrarogas,* hypogonadism, etc. But important in this respect is *sarapareeksha* and *pramana pareeksha* as they may reward more information.

Sarapareeksha

Evaluation of *sara* provides an idea of the status of *dhatu*s in the body in relation to the *bala* of the patient. Eight types of *sara purusha*s can be identified by the classical features as described in the ayurvedic compendia. A perfectly healthy individual is having all *sara* in proper healthy state. *Sukrasara* is most important in the part of physical examination. It should be evaluated and graded as *pravara, madhyama* and *avara.* The testosterone level may serve as the most reliable single objective parameter for the assessment of *sukrasara* though volume of semen, total sperm count, motility, serum protein, Hb%, etc. can be considered.

Pramanapareeksha

The penis should be examined noting any serious abnormalities like chordee, nicropenis, etc. The adult penis is 8-12 cm long. In hypogonadism the penis is infantile and less than 2.5 cm long. The size and consistency of the testes should be evaluated as well as the presence of bilateral or unilateral cryptorchidism. The corpora cavernosa should be palpated to rule out Peyronies plaques. Evidence of bladder distention should be sought, as that might suggest the presence of a neurogenic bladder.

Vascular and neurologic examination

The vascular tree may be evaluated by palpating femoral as well as dorsalis pedis pulses, and also the dorsal penile pulses and their quality should be noted. Evidence of atherosclerosis may suggest similar changes in the arteries to the cavernosa. Neurological examination referable to the sacral dermatomes includes anal sphincter tone, bulbocavernosus reflex, Babinski reflex, ankle jerk, and pin-prick sensation in the perineum. The bulbo cavernosus reflex is evoked by squeezing the

glans penis and digitally palpating the anal sphincter area. In addition, a thorough rectal examination should be performed to rule out any neoplastic prostatic disease.

Investigations

Psychometric testing

There are numerous psychometric tests applied to the diagnosis of patients with erectile dysfunction. By performing this study, 90% of patients were correctly identified under psychogenic impotence. Due to high failure rate, it is rarely advised in our time.

NPT testing

From early childhood through eighth decade, erections, occur during normal sleep. This phenomenon, termed nocturnal penile tumescence (NPT), occurring during rapid eye movement (REM) sleep is a useful tool in differentiating psychogenic impotence from organic. The patient with psychogenic impotence will be expected to have normal number of nocturnal erections whereas organic not expected to have normal erectile activity at night also. NPT testing still remains as an important part of evaluation of the impotent patient.

Method

Penile tumescence is measured by two strain gauges that are positioned around the subcoronal region and around the base of the penis. NPT testing is usually done over 2 to 3 night to obviate the 'first night effect' (poor sleep status and poor tumescence is found secondary to the measurement of tumescence itself). The normal findings are 3 to 5 erectile episodes per night each ranging from 25 to 35 minutes in duration.

Hormone levels

Serum testosterone and prolactin levels should be assessed. Patients with a diminished or low normal testosterone levels should undergo repeated serum testosterone studies. Patients with high prolactin levels are to be evaluated further. If repeated serum testosterone levels remain low and gonadotropin levels are not appropriately elevated, the patient should be referred to an endocrinologist for further management.

Vascular testing techniques

This method is of two types – invasive and noninvasive. These are usually employed to evaluate both blood pressure and blood flow within the penis.

Non-invasive

The most commonly used method in a non-invasive manner employs a Doppler stethoscope. A special 1.2 inflatable cuff is applied at the base of the penis to measure systolic BP in both dorsal and cavernosal arteries. Inflating the cuff above systolic pressure and slowly deflating the cuff until the blood flow is re-established as determined by the Doppler probe, decides state of artery. The other methods used include - Plethysmograph, Spectroscope and Doppler ultrasound.

The ratio of penile systolic blood pressure to brachial systolic pressure termed as PBl (Penile Brachial Index). A ratio of 0.6 or less has been related to vasculogenic impotence. The penile systolic pressure (PSP) has also been related to penile Brachial Mean Index (PBMI). PSP less than PBMI by 30mm of Hg or more is an indicative of significant vascular insufficiency. Another study to consider is the penile Flow Index (PFI). More recently a dynamic penile Doppler study, known as the pelvic steal test, has been developed. In this, PBI determinations are made on both corporal cavernosal arteries

at rest and following leg and buttock exercises. Fall of PBI of greater than 0.15 after exercise is indicative of decreased blood flow to the penis. Patients who have difficulty in maintaining erections, especially during movement may have a "steal phenomenon", in which blood is preferentially directed towards muscles in the legs or buttocks, thereby causing insufficient flow to the pudendal artery.

Invasive

Invasive vascular techniques aim at the diagnosis of arterial vascular insufficiency (pudendal arteriography) and venous vascular insufficiency (Infusion cavernosography). During pudendal arteriography, chances of complication are more and may need arterial repair. Hence it is better to reserve this technique for patients with clear evidence of vasculogenic impotence. The second invasive procedure to be considered is infusion cavernosography. This technique is used to rule out abnormal cavernosal filling or anomalous venous drainage.

Specialized neurologic testing

Specialized studies utilizing evoked potentials in addition to a neurologic examination are performed for determining a neurologic causation. But all these tests are rarely employed now due to high failure rate and expensive procedures. Some experts recommend biothesiometry as an excellent screening test for penile sensory disturbances. It requires a device capable of sending vibratory signals to the skin; that can be quantified in terms of voltage. The fingers of both hands and the toes on both feet are tested first, followed by penile skin. In normal individuals, the same vibratory threshold will be found in the fingers, toes and the penis. Based on these methods of evaluation, we can categorize patients into various aetiologic groups.

Reversible causes of impotence

Before discussing the management let us search first for reversible causes of impotence. Impotence is potentially reversible in the following types of patients:

- those on medication for high BP
- those on medication for depression
- those who have endocrine problems like thyroid and pituitary problems
- those who have partner conflicts
- those who having habit of smoking
- those who use recreational drugs alcohol, marijuana, cocaine, heroine, etc.
- those who have an anatomical abnormality of penis
- Men less than 45 years of age, and have a correctable cause of vascular impotence

Prognosis of *klaibya*

Sahaja klaibya and *marmaccheda janya klaibya,* resulted from castration (*vrishanot-patana*) or *sephaccheda* are mentioned as incurable by some *acharya*. Some opine *kshayajanya* and *dhwajabhangaja* are also incurable. All other varieties have a better prognosis. Even for *sadhyaklaibya* chronicity worsens the prognosis.

MANAGEMENT OF IMPOTENCY

Management of impotence depend mainly on the causative factors, whether dysfunction is primarily psychogenic organic or of mixed origin. Checking of contributory factors like hypertension, diabetes mellitus, smoking, pelvic trauma is essential. The therapeutic options for an impotent patient include (a) psychotherapy and behavioral therapy, (b) drug therapy, (c) non-invasive procedures

(d) invasive prostheses and (e) vascular surgeries.

Staging of treatment

The patient and partner must be well informed about all therapeutic options including their effectiveness, possible complications and costs. As a general rule, least invasive or least dangerous procedures should be tried first. Psychotherapy and behavioral treatments, and sexual counseling alone or in conjunction with other treatments may be used in patients with erectile dysfunction. In patients with true endocrinologic dysfunction, androgen replacement may be of value.

Invasive therapy should not be the primary treatment of choice. If all measures fail, intracavernosal injection therapy or vacuum devices can be offered after discussion with the patient and his partner. If a single therapy is ineffective, combining two or more forms of therapy may be useful.

With any form of the therapy for impotency, long term follow up by health professionals is required to assist the patient and his partner with adjustment to the therapeutic intervention. This is particularly true for intracavernosal injection and vacuum constriction therapies.

Various therapeutic options

Psycho and behavioral therapies

Careful attention to the psychosocial factors and attempts to relieve sexual anxieties should be a part of the therapeutic intervention for all patients with psychogenic impotency.

Proper education and description about normal sexual act relieve depression and anxiety as well as to improve sexual function. Social considerations are important in cases where the social structure is inhibiting (e.g. lack of privacy).

Drug therapy

Drugs for treating impotence can be taken orally, inserted into the urethra, applied over the penis or even injected directly into the penis.

Hormonal therapy

In patients where impotence is truly secondary to androgen deficiency in hypogonadism, the usually applied androgen replacement therapy is testosterone cypinoate in oil 200 mg IM every 3 weeks or fluoxymesterone 5 mg daily orally. But this is inappropriate in patients with normal androgen concentrations and if done may carry significant health risks. In patients with hypogonadism secondary to hyper prolactinaemia, treatment with bromocriptine - a dopamine agonist - usually results in return of potency.

Oral medicines

In March 1998, Food and Drug Administration approved sildenafil citrate (marketed as viagra), the first oral pill to treat impotence. Taken one hour before sexual activity, viagra works by enhancing the effects of nitric oxide (NO), a chemical that relaxes the smooth muscles in the penis during sexual stimulation allowing increased blood flow. The recommended dose is 5 mg. The physician may adjust this dose to 100 mg or 25 mg depending on the needs of the patient. The drug should not be used more than once a day.

Sildenafil is supposed to have an adverse effect of myocardial infarction (MI) or ischaemic heart disease (IHD). The oral drug deserves a special attention here, Yohimbine an alpha blocking agent chemically similar to reserpine. It is considered as an aphrodisiac.

Another drug trazadone, an antidepressant has shown some positive effect in the night

erections. But this drug is notable for the number of reports of priapism that has been associated with its use.

Intracavernosal injection therapy

Intracavernosal injection therapy has become more common in recent years. It has been tried in dysfunction due to a variety of causes. Psychogenic and neurogenic dysfunction usually responds well, but dysfunction of vascular origin is unlikely to give a satisfactory response.

The main agents investigated for injection therapy are papaverine, phentolamine and alprostadil. It should be very careful as these drugs may create side effects, including priapism and fibrosis, especially with papaverine. One of the major hurdles to the patient acceptance of intra cavernosal drugs is the requirement for repeated self-injection into the penis.

Topical therapies

A number of studies have investigated topical therapies. A system for inserting a pellet of alprostadil into the urethra is marketed as "*muse*". The system uses a prefilled applicator, to deliver the pellet about an inch deep into the urethra at the tip of the penis. An erection will begin within 8 to 10 minutes and may last for 30 to 60 minutes. The most common side effects of the preparation are aching in the penis, testicles and area between the penis and rectum, warmth or burning sensation in the urethra, redness of the penis due to increased blood flow and minor urethral bleeding or spotting.

Vacuum devices

Commercially available mechanical devices that utilize a vacuum to produce erection and a rubber band to restrict venous return at the base of the penis provide a successful non-surgical alternative in many patients, including those with diabetes mellitus and severe vascular disease.

Surgical intervention

Penile prostheses

The surgical approach to erectile dysfunction is based mainly on implantation of a penile device. Presently silicon prostheses are available with natural appearing erections and better functions (Fig.1). Three types of prostheses are mainly used – rigid, semi-rigid and inflatable. The particular operative approach to be used should be carefully chosen.

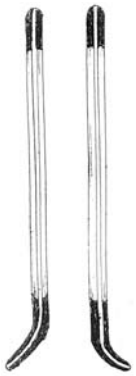
Vascular surgeries

Vascular surgeries are aimed at increasing vascular supply to the corpora or at decreasing venous drainage of the corpora. Procedures are two types viz. direct revascularisation and indirect revascularisation

Direct revascularisation: - This is achieved by anastomosing the vessel to tunica albuginea. This procedure has been largely abandoned because of poor long-term results and causation of priapism.

Indirect revascularisation: - In this procedure, inferior epigastric artery is anastomosed to either of these. Indirect revascularisation has several theoretical advantages over the direct method. The arterial anastomosis is proximal to vasomotor area, thus allowing for a more physiologic erection to occur. In addition, the corporeal tissue is not exposed to systemic blood pressure over prolonged periods of time, thus obviating the potential for priapism and corporal fibrosis.

The patients who may clearly benefit from this



a

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c

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Fig. 1 Penile prostheses

a) Small - Carrion twin rod prosthesis **b**) Jonas malleable silver wire prosthesis
c) Finney hinged prosthesis **b**) American Medical Systems M700 inflatable prosthesis

type of surgery are impotents resulted from trauma to perineum or pelvis, because abnormalities are limited to pudendal artery, sparing dorsal arid corporal arteries. There is less chance of advantage by this procedure in old age patients with generalized atherosclerosis.

Treatment for local penile diseases

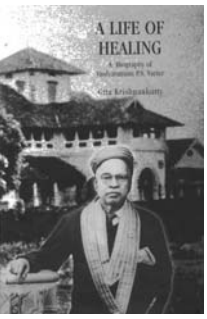
Peyronie's disease

Medical treatments have been found to have little effect on the course of this disease. There is however some evidence that tamoxifen may help some individuals who experience pain on erection, Surgical intervention is only indicated when the deformity is sufficient to prevent intercourse and when the disease has established. Corrective surgery for the curative may be performed by incision or excision of the plaques, but in some situations, penile implants may be more appropriate.

Priapism

Initial treatment for priapism involves corporeal aspiration using a 19-21-gauge butterfly needle under aseptic conditions. If this is unsuccessful, instillations of an alpha-adrenergic agonist into the corpora are usually effective. If these are unsuccessful an operative intervention to produce a shunt, to allow drainage from the erect corpora cavernosa may be required.

(To be concluded with next issue)



A LIFE OF HEALING
(English)

Gita Krishnankutty

Pub.by Viking Penguin Books
Price: 395/-

A biography of Vaidyaratham P.S. Varier reconstructs the history of this extraordinary man and the institutions he established and nurtured. It shows how an ordinary student, spurred on by curiosity and determination to explore avenues of knowledge, succeeded in improving, modernizing and popularizing ayurveda at a time when allopathic medicines were making inroads into the Indian market.

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DIFFERENTIAL GENE EXPRESSION IN NEEM TAKES ROOT IN AYURVEDA

Arun Shastry and Parvathi Chary*

Abstract: The plant neem (*Azadirachta indica*) has been widely documented in ayurveda. In this paper, the authors discuss the curative and preventive effects of the plant both on internal and external parasite with reference to ayurvedic classics.

Neem (*Azadirachta indica*), belonging to the family Meliaceae is the wonder plant of India that has proved from time immemorial to be a panacea for all ailments. There may perhaps no other tree known to man that has so many varied potential benefits for humanity.

The curative properties of this plant were attributed to the belief that a few drops of nectar fell on it. The efficacy of neem as a medicine has been documented in several different ancient treatises like *Atharvaveda*, *Ghrhyasutra*, *Sutragrantha* and in the *Purana*s. In Sanskrit, it is referred to as *nimba*, which is a derivative of the term *nimbati svastyam dadati* which means that which gives good health.

It is one of the main ingredients in every blood purification formula used in ayurveda. In *Charakasamhita* it is documented that *nimba* is one of the main plants possessing antipruritic properties[1].

Traditionally, in ayurveda, neem seed oil, aqueous extracts of neem leaf, neem leaf powder, the smoke from burning dried neem leaves, and neem leaf pastes have been used for the prevention and treatment of fungal conditions like Athlete's foot, ringworm, and Candida which causes vaginal yeast infections and thrush. In essence, components from neem seeds and leaves have proven to have anti-bacterial, anti-fungal, anti-viral and anti-insecticidal properties.

Thus, this tree has proved to be effective against all kinds of skin disorders. According to *Charakasamhita* in ancient times neem was used for alleviating leprosy[2].

As quoted in ancient texts, neem has proven to have both curative and preventive effects on both internal and external parasites. Some examples include the malarial parasite (internal) and external parasites infecting the scalp in the form of head lice. Traditionally neem oil was applied externally to the hair, scalp and skin for parasites and as an insect repellant.

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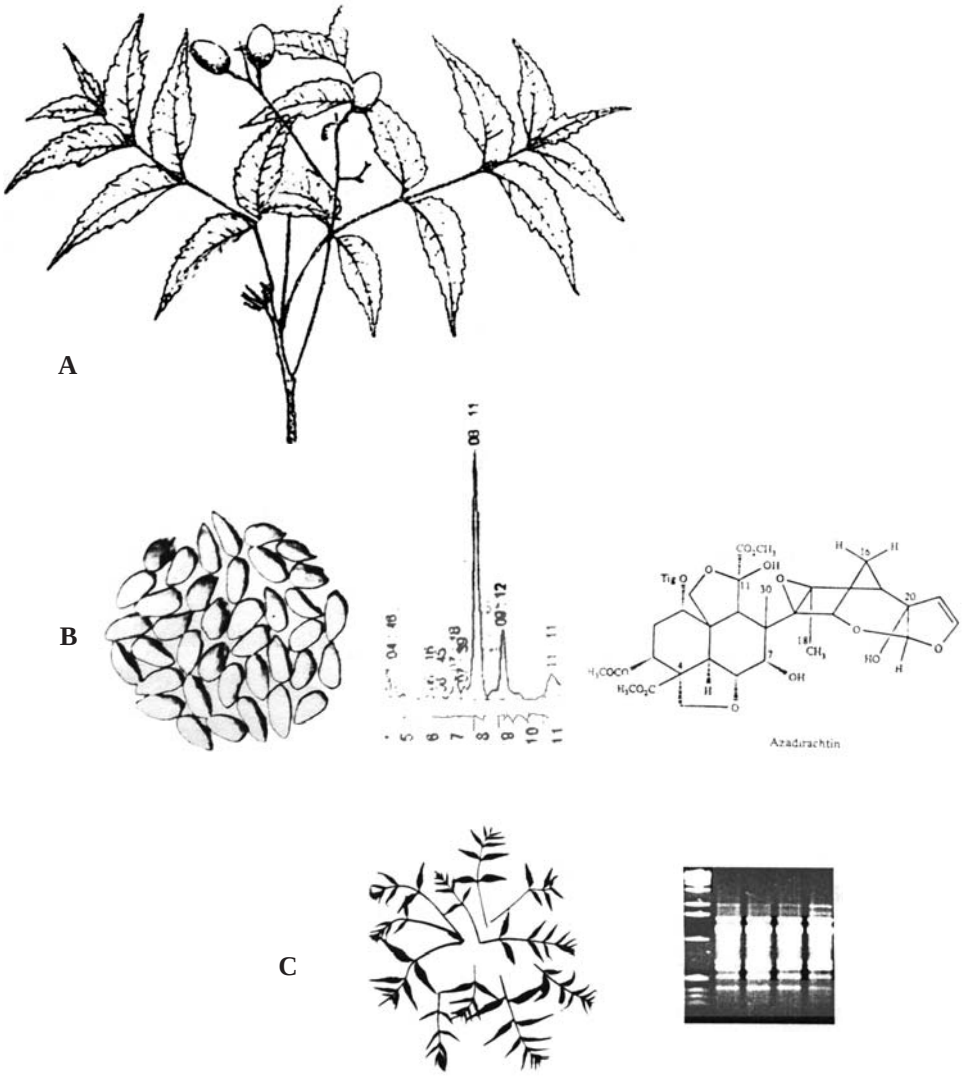

Fig. 1

A) The top panel indicates a neem twig with a compound leaf and fruits;
B) The middle panel shows neem seeds, the kernels of which are utilized to extract the antifeedant, which is a tetranortriterpenoid, called Azadirachtin-A. The compound was analysed by using HPLC, as indicated by the peak at 217nm. The structure of this compound is indicated in the extreme right;
C) The bottom panel shows tender neem leaves that were used for isolating pure genomic DNA. The DNA thus extracted was used for PCR amplification using ISSR primers for DNA fingerprinting studies.

Simple aqueous extracts of neem leaves have been the standard treatment for external parasite infestation in villages throughout India. Although the edaphic effects of this tree have been studied only in recent times, their effects against lice, itch mites that cause scabies and intestinal worms have been documented in *Charakasamhita*. There is a description about external parasites present in the body, hairs, beard, moustache, small hairs and eyelashes[3].

Charakasamhita also describes about worms grown in intestines and feaces[4].

The treatment against above parasites includes, warm decoctions added with pastes composed of *nimba* with *madanaphala*[5].

Thus, in spite of the antiquity of neem it is only in the past two decades that interest in neem research has taken an impetus. Intense biochemical studies have lead to the identification of more than 200 liminoids. Many of these secondary metabolites have been proven to have potentially biopesticidal or antifeedant properties. Among these, Nimbin, Nimbidin, Salanin, and Azadirachtin-A have been studied in some depth. However, despite earnest efforts, the biochemical pathway for the synthesis of Azadirachtin -A is incomplete.

To date Squalene synthetase is the last identified enzyme in the pathway, which leads to the formation of Squalene. However, this compound forms the starting material for several major compounds including steroids, triterpenoids, tetraterpenoids, tetranortriterpenoids and numerous other complex molecules. Azadirachtin-A is known to be a tetranortriterpenoid, which has edaphic mimicking properties, thus serving as a potent insect antifeedant.

Several researchers have directed their attention towards insecticidal, nematocidal, antimicrobial, and anti fungicidal activities of Azadirachtin. Their efforts yielded but rudimentary results. DNA fingerprinting studies are also being performed on neem but because of the complexity of the genome, little correlation can be drawn between the polymorphic pattern of the amplified DNA and this secondary metabolite. However, the status of the molecular study today on this plant stands at the cataloguing level of high versus low Azadirachtin containing plants.

It is imperative and of primordial importance to study the biochemical pathway leading to the formation of Azadirachtin. This is of great importance because it is essential to determine the enzymes which are involved in this pathway beyond the production of Squalene. Once the enzymes involved in the formation of the end products are known, the and only then molecular studies will be of some relevance to the society.

Towards this goal, once the above genes are identified and sequenced, hybridization probes can be made to serve as markers to distinguish between high and low Azadirachtin containing plants. The mRNA can be isolated from various plants and hybridized with this specific probe-X which is complementary to the sequences present in the genes that code for enzymes either in the penultimate or the ultimate step in the Azadirachtin production. The mRNA extracted will be essentially electrophorized on agarose, gels, and Northern blot hybridization will be performed with this probe- X. Eventually, specimens that yield a higher signal with this probe can clearly be identified as plants containing high Azadirachtin content.

This will prove to be a great asset for industrial

purposes wherein large quantities of Azadirachtin need to be isolated and utilized at a commercial level within the country and also could be exported. This commercial level within the country and also could be exported. This aspect of research becomes relevant because, although neem trees grow wildly in almost all parts of India, yet if plants with high total Azadirachtin can be readily detected using these molecular techniques, it would be a boon to the society.

Recently several patents have come up in the field of neem, thus making the plant even more valuable. The US Academy of Sciences currently attaches very high importance to the neem tree. The United Nations declared neem as the "Tree of the 21st Century". Thus, both traditional review and modem scientific evidence points to the fact that neem truly is a "Miracle tree".

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tiktālābukabījaṁ kampillakasarṣapauvacādārvī
ētaistailaṁ siddhaṁ kuṣṭhaghnaṁ yōga ēṣa cālēpa:
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PHYSIO-ANATOMICAL ASPECT OF *GRAHANI* WITH REFERENCE TO PHYSIOLOGY OF DIGESTION

Harshitha Bajaj*

Abstract: *Grahani* is a specific structure described in ayurveda. This paper gives a brief sketch of the anatomy and physiology of *grahani* with reference to the physiology of digestion. Relationship of *pachakapitta* and *grahani* and their physiological aspects are also dealt with.

Introduction

Charaka, Susruta and Vagbhata have described the anatomy and location of *grahani* in different ways, but on going through their texts one may find that they do not differ much from one another in the description of *grahani*. The anatomy and physiology of *grahani* can be seen described simultaneously in different ayurvedic texts.

Susruta has described the structural and anatomical position of *grahani* as *sasti pittadharakala*, which is situated between *pakvasaya* and *amasaya*. The *kala* has been described as firm membranous structures that separate the *dhatu*s from *asaya*s. According to Sarngadhara, the moisture present in the *dhatu*s undergoes transformation by the heat of body and form the structure known as *kala*. *Kala* is attributed with property of semipernesis so *kala* is mucosal lining of hollow visceral organs.

Pitta

Human body is a mini universe; all those factors active in universe for its maintenance are represented in human body also. All changes in this universe and body are supported by *agni*. So, the *agni* represents in whole universe whether it is a living thing or abstract matter and no substance on earth can exists without *agni*. The term *agni* is derived from the root *agni gatau* which means the movement, motion or charge. It gives the idea of dynamism in the body or worldly phenomena caused by *agni*.

Pitta is only a biological name of *agni*. The *agneya* constituents of the body are known to be *pitta*. The functions attributed to *agni* and *pitta* are almost similar and associated so close that it is very difficult to distinguish *agni* from *pitta*.

The effect of fire at physiochemical level is decomposition, disintegration and acceleration of various chemical reactions occurring in

**P.G. Scholar (Kaya chikitsa), S.A.C. Lucknow.*

nature. Similarly, the main function of the *agni* in the body is to breakdown or to disintegrate the food into simplest possible components, making it suitable for absorption and utilization by body. Technically, these functions are termed as digestion and metabolism. In ayurveda, the concept of biological *agni* has been referred to as a) *agni* and b) *pitta*. The functions attributed to them are *dahana, pachana, tapana,* etc. The physiological aspect of *pitta* is the biochemical substance that responsible for digestion.

Grahani

Grahanat grahani mata – the quotation from *Charakasamhita* indicates that *grahani* is termed so because it receives (*grahan*) undigested food from above (stomach) and retains till it is digested. Also, it is called *grahani* because the body receives its nutrients from this site i.e. the food nutrients are absorbed from this area.

Both *Charakasamhita* and *Susrutasamhita* refer to the situation of *grahani* in the body. *Charakasamhita* says that *grahani* is an organ of *kostha* (abdominal cavity) situated in the region above the *nabhi* which is also the seat of *agni*[1]. Susruta has described *grahani* as *sasti pittadharakala* which is situated in between *pakvasaya* and *amasaya,* as such it starts where *amasaya* ends and continues up to the beginning of *pakvasaya*[2].

Pachakapitta* and *grahani

According to ayurvedic classics, *pachakapitta* resides in *grahani*, hence the function of *grahani* depends upon the strength of *agni*, thus *grahani* and *agni* are interdependent[3]. Both *agni* and *grahani* are reciprocal in relations i.e. *agni* supports the function of *grahani* and *grahani* the function of *pitta*. So *pachakapitta* is nothing but internal secretion of *pittadharakala*.

Our life span depends on this *agni* (*pachaka-pitta*). The vital role of the *agni* for the very existence of human life has been appreciated by the authors of ayurvedic texts in unequivocal terms. According to Charaka, *agni* is essential for the body like the roots for the plants. He opines that the life, colour, complexion, vigor, vitality, strength, physique and enthusiasms all depend on the *agni*.

In addition, other vital parts and processes, essence of all the tissues and different types of *agni* are also governed by *kayagni*. So long as this *agni* is normal, one lives a long life free from diseases and when it gets vitiated, one suffers from disease[4].

So, we can say that *pittadharakala* is stated to cover that part of *kostha* (gastro intestinal tract) which is described as *grahani* and it is related with the digestion of food. *Pachaka-pitta,* secreted in this area, digests the food. In this context, *pittadharakala* and *grahani* are used as synonyms to one another.

Ashtangasangraha gives further information regarding the structure and function of *grahani*, Vagbhata mentions that 6th *kala* is known as *pittadharakala*, which is situated in between *amasaya* and *pakvasaya*. It is the seat of *jatharagni*; by its potentiality the food is digested and absorbed and the waste products being excreted. As it receives the undigested food for digestion it is known as *grahani*. *Ashtangahridya* further synthesizes the idea of Charaka and Susruta and concludes what has been said as *pittadharakala* by the followers of Dhanvantari School.

Some Controversy has been prevailed regarding anatomical identity of *grahani* among scholars

of ayurveda. *Siddhanta Nidana* of Mahamahopadhyay Kaviraj Dr. Gananath Sen elaborately discusses various aspects of *grahani* and concludes that the proximal twelve fingers portion of small intestine is *grahani*. It means that he has considered duodenum as *grahani*. Dr. B. G. Ghanekara, in his commentary on *Susrutasamhita*, discusses the anatomical identity of *grahani* and concludes the mucous membrane of entire small intestine as *grahani*. Prof D. S. Gaur and Pandit Hariprapann Sharma also hold the same view. Vaidyaratnam P. S. Varier regards pyloric valve to be taken as *grahani* in the body. Thus, it can be seen that *grahani* has described variously differently in ayurveda. However, the scope of *grahani* cannot be restricted to the duodenum or pyloric valve, for digestion and absorption is a process that happens in whole part of small intestine.

So, we can say that *grahani* is a lining membrane of gastro intestinal tract extending from pyloric end of stomach to iliocecal junction because this demarcates the cavity of *asaya* of small intestine and *mamsadhatu* that partakes in the formation of wall of small intestine; thus, *pittadharakala* is a structure that makes *pachakapitta* available, so it serves as the covering membrane and in addition also as a seat of various glands responsible for secretion of digestive enzymes.

Functions of *grahani*

According to *Charakasamhita,* normally *grahani* holds up the food and after completion of digestion, the reinvents of food i.e. *kitta* are propelled for excretion. Contrary, when the digestive capacity is inadequate due to vitiation of *agni*, undigested and partially digested food is passed on quickly by *grahani*[5].

According to *Susrutasamhita,* the *pittadharakala* holds four kinds of, viz. those that are chewed, swallowed, drunk or licked, solid and liquid foods propelled from stomach and on its way to the intestines, are digested in proper time through the heating agency of *pitta*[6].

Vagbhata describes the functions of *grahani* in more detail. He refers to *grahani* that which receives undigested food from stomach and does digestion and convert it into very smaller particles. After digestion, it assimilates food particles and convert the digested food into *sara* and *kitta* part; the *kitta* part i.e. *mala* sends to *pakvasaya*[7].

Pachakapitta

Human body is an outcome of nutrition. The nutritive substances ingested meet a complex chain of chemical reaction before being converted as a part and portion of human body. As a result of these chemical reaction, the substances under go a phenomenon i.e. breakdown and changes into other substances. The agent responsible for these complex changes of reaction is *pachakapitta*.

Digestion

The food can be classified as carbohydrates, proteins and fat. However, they can not be absorbed to gastro intestinal tract mucosa in natural form; therefore, they are useless as nutrients unless and until they undergo the preliminary process of digestion. So *pachakapitta* is responsible for making these unabsorbable nutrients into assimilative form in *mahasrotas*.

In ayurveda, the process of digestion takes place in two forms and it is known as *paka*; it is further classified as 1. *avasthapaka* and 2. *nistapaka*.

The food taken into mouth is forced down by *pranavayu* and reaches the *amasaya* where food is disintegrated and softened by fluid and gets mixed with *pachakapitta.* During the process of digestion when the food is half burnt and descending from stomach due to predominance of *amlabhava*, it gets further digested in the *grahani* by *koshthagni* (digestive fire) and lastly when it reaches in the large intestines it is absorbed by fire and gets converted into solid mass and *vayu* is formed due to predominance of pungency. All these processes comes under the name of *avasthapaka.*

Avasthapaka

Avasthapaka includes *madura*, *amla* and *katu*. *Madhurapaka* occurs up to the level of *urdhava amassaya*; *amlapaka* occurs in second part i.e. *grahani*; and *katupaka* occurs in the third part i.e. *pakvasaya* Charaka says that ingested food has six *rasa*s. First of all possess *madurapaka* and at this stage forms and secretes *kapha* which is a mucus-like fluid having frothy appearance. In the process of further digestion, the food possess under *amlapakavastha* and while it comes out in the stomach stimulates the secretion of *acchapitta* (mixed pancreatic and bile juices); after digestion, the food reaches the large intestine (*pakvasaya*) where *mala* is solidified due to activity of *vata* and this stage is known as *katupakavastha*.

Correlation with modern concept

According to modern concept, carbohydrates are large polysaccharides which are combination of many mono-saccharides bound each other by condensation mechanism; the process by which the separation of mono-saccharides done is known as hydrolysis. In the same way the hydrolysis of triglycerides transforms fat into absorbable form. Digestion of proteins also involves hydrolysis. This physiology of digestion is based on hydrolysis, therefore, it becomes imperative that *pachakapitta* is initiator of digestion and digestion ends at *pilu* and *pitharpaka* at cellular level. Separation of *sara* and *kitta* takes place in this area; *sarabhava* is restrained in this region till it is absorbed while *kitta* is propelled into *pakvasaya* with the help of *apanavayu*.

The salivary digestion acting on carbohydrates leading to its breakdown into sugars occurring up to the level of cardiac end of stomach has been described as *madhurapaka*, Gastric digestion where the acid chyme forms is termed as *amlapaka*. The phenomenon of pancreatic and biliary digestion has been pointed out with elucidation of secretion of *acchapitta*.

***Vipaka* (*nisthapaka*)**

The term *vipaka* has been defined as the change in the *rasa* substances by the effect of *jatharagnipaka*, which is supposed to be reflected at the end of digestion. *Vipaka* is an out come of digestion and therefore it must occur in GI tract. As no further change takes place, it stands as the final processing of gastrointestinal digestion. The absorbed nutrients reach the system as such and they cause effect on various tissues and organs of the body. The relation between *avasthapaka* and *vipaka* is just as cause and effect. Another important function of *pachakapitta* or *jatharagni* is to help in *sarakittavibhajana.* In this process, all kinds of nutrients are absorbed and faeces are made for expulsion. Factors like osmotic pressure, selective action of lacteals, role of phagocytes and a few other biochemical processes are responsible for absorption with

reference to statement that *pitta* takes part in absorption. The power of absorption depends upon the condition and health of villi of small intestine. Therefore, this membrane may be equated with *pittadharakala* and its integrity depends upon the *agni*.

Charakasamhita refers to *agni* that digest food as the master of all *agni*s, for the increase and decrease of other *agni*s depends on the digestive fire.

Five *agni*s pertaining each to *prithivi, ap, tejas, vayu* and *akasa* digest respective fraction of food. The food nourishes *dhatu*s, *ojus*, strength and complexion depends on *agni* because *rasa* (*sarabhaga*) cannot be produced from undigested food.

Conclusion

The *pachakapitta* which resides in *grahani* splits the different component of food into respective units. Five *bhutagni*s at this level makes the absorption of end products of digestive food and *saptadhatvagni*s transform metabolites into specific seven tissues which are *rasa, rakta, mamsa, meda, asthi, majja* and *sukra*. On the other hand metabolic wastes are also under the influence of same *agni*s. Thus *pachakapitta* and different *agni*s implicated in *pitta* carry on vicious cycle of anabolism and catabolism resulting into production of energy made available for different activities and repair of different tissues. *Pitta* is the leader of this mechanism going on in the body.

Vagbhata says that *pachakapitta* is also responsible for increase or decrease of *dhatu*s according to states of *pitta* presents in them. So, we can conclude that the long and healthy life span of a person depends on the state of *grahani* and *pachakapitta* as it increases *veerya, ojus* and nourishes *panchbhutagni* and seven *dhatvagni*s[9].

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6. षष्ठी पित्तधरा या चतुर्विधमन्नपानामाशयात् प्रच्युतं पक्वाशयोपस्थितं धारयति अशितं खादितं पीतं लीढं कोष्ठगतं नृणाम् तज्जीर्यति यथाकालं शोषितं पित्ततेजसा ।
   सु. शा. ४/१८-१९
7. समानोऽग्निसमीपस्थः कोष्ठे चरति सर्वतः ।
   अन्नं गृह्णाति पचति विवेचयति मुञ्चति ।।
   अ. हृ. १२/८
8. यदन्नं देहधात्वोजोबलवर्णादिपोषकम् ।
   तत्राग्निर्हेतुराहारान्न ह्यपक्वाद्रसादयः ।।
   च. चि. १५/५
9. सैव धन्वन्तरिमते कला पित्तधराह्वया ।
   आयुरारोग्यवीर्यौजोभूतधात्वग्निपुष्टये ।।
   अ.हृ. शा. ३/५०

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MACRO AND MICROSCOPICAL STUDIES ON THE LEAVES OF *SALVADORA PERSICA* L.

T.R. Shantha and T. Bikshapathi*

Abstract: Macroscopical and microscopical studies, therapeutic uses and diagnostic characters of the leaves of *Salvodara persica* are discussed in this paper.

Introduction

Salvadora persica L. of the family Salvadoraceae is known as *brihatpilu, mahaphala* in Sanskrit and *perungoli, uga* or *uka* in Tamil. In English, it is known as *tooth brush tree*. Leaves possess antiscrobutic and astringent properties. Dried leaves in small doses are given with copious amount of water for the treatment of flatulent dyspepsia. Tender shoots and leaves are used as salad. A decoction of the leaves is used in asthma and cough and a poultice made out of them is applied to painful tumours and piles (Anonymous 1972).

The shoots and leaves are pungent and are considered in Punjab as an antidote to all sorts of poisons. The juice of leaves is given in scurvy. The leaves are used by the country people in the South of Bombay as an external application in rheumatism (Kirtikar & Basu 1975). The leaves are used as folk medicine in the diseases like asthma, cough and as also a purgative (S.K. Jain 1991). A new indole alkaloid Salvadoricine (C_{11} H_{11} N O M P 143 - 4^0) has been isolated from the leaves and its structure elucidated by spectral analysis (Malik. S. et a1 1987).

As there is no record of the pharmacognostical studies of the leaves of this taxon the present work was taken up (M.A. Iyengar 1976 and Mitra. R. 1986).

Materials and methods

The identified plant material was procured from S.M.P. Unit of Palayamkottai, Tamil Nadu and standard methods of microscopy were followed by Johansen (1940) & Wallis (1967).

Distribution: The plant has distribution throughout the drier parts of India, Baluchistan, Ceylon, dry regions of West Asia and Egypt.

Morphology: A large, much branched, evergreen shrub or small tree with soft whitish yellow wood. Leaves elliptic, lanceolate or ovate; petioles long and glabrous; flowers greenish yellow in axillary and terminal compound panicles; calyx long, glabrous; corolla very thin, persistent; stamens shorter than corolla; drupes globose, smooth, red when ripe (Fig I).

**Regional Research Institute (Ay), Jayanagar, Bangalore.*

Fig. I. **a - d** *Salvadora persica* Linn. - Morphology
a) Flowering shoot **b**) Flower **c**) Inflorescence **d**) Leaf

Macro and Microscopical characters

Leaf petiole

Leaf petioles are long, thin and light brown, glabrous, measures 1.3 to 2.2 cm. in length.

Transverse section of the petiole is circular in out line and shows epidermis, cortex and vascular region (Fig II a,b&c)

Epidermis is single layered, made up of rectangular parenchymatous cells covered by thin cuticle. It is followed by 12 to 15 layers of cortex where upper 3 to 4 layers of cells are small, rounded, collenchyma and remaining cells are big, rounded and parenehymatous. Some of the cells show thick walled cells, oil globules and clustered crystals of uncertain chemical composition. Vascular bundle is in the form of arch, curved and shows well developed xylem and phloem tissue. Phloem fibers are also present in between thin walled, polygonal parenchymatous phloem cells. Abundant clustered crystals of uncertain chemical composition are present in the form of arch near the vascular bundle region. Ends of the vascular are strands inwardly directed and the xylem including well developed inter-xylary phloem. Phloem fibers are in small groups in between the polygonal phloem cells. (C. R. Metcalfe & Chalk. L. 1950).

Leaf

Leaves glaucous, elliptic, lanceolate or ovate, obtuse, base usually acute, less commonly rounded. Margins wavy, measures 3.8 to 6.3 by 2.8 to 3 cm. Odour pleasant with sweet taste. (Fig III).

Transverse section of the leaf through mid rib region shows dorsiventral in structure and shows upper and lower epidermis made up of rectangular double layered epidermal cells on both sides of the leaf. Both upper and lower epidermis are followed by 2 to 4 layers collenchymatous cells followed by 2 to 3 layers of parenchymatous tissue. In the centre well developed vascular bundle is present. Vascular bundle is encircled with abundant clustered crystals of unknown chemical composition (Fig. IV a&b).

Transverse section through laminar region shows upper and lower epidermis made up of double layered epidermis. 2 to 3 layered palisade tissue and spongy tissue, and in between the veins vascular bundles are present with well developed xylem and phloem covered by bundle sheath and rubiaceous type of stomata present only on the lower side of the leaf (Fig. IV d); clustered crystals of uncertain chemical composition occur in the mesophyll tissue in a large cavity (cell). (Fig. IVc). Some

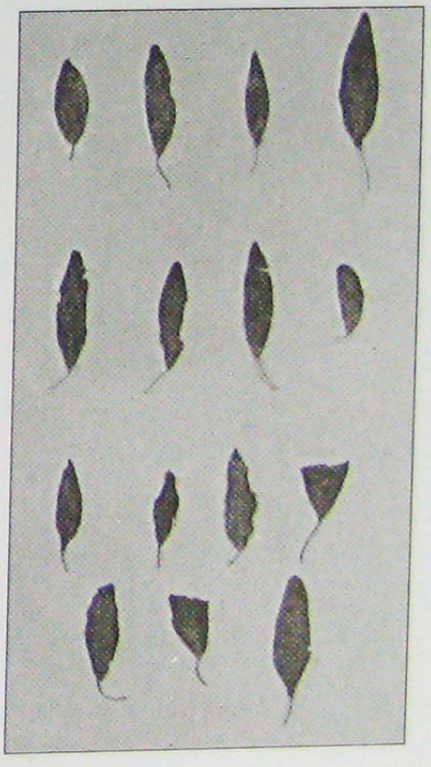

Fig. III

Salvadora persica Linn. - Macroscopical characterers - Leaf

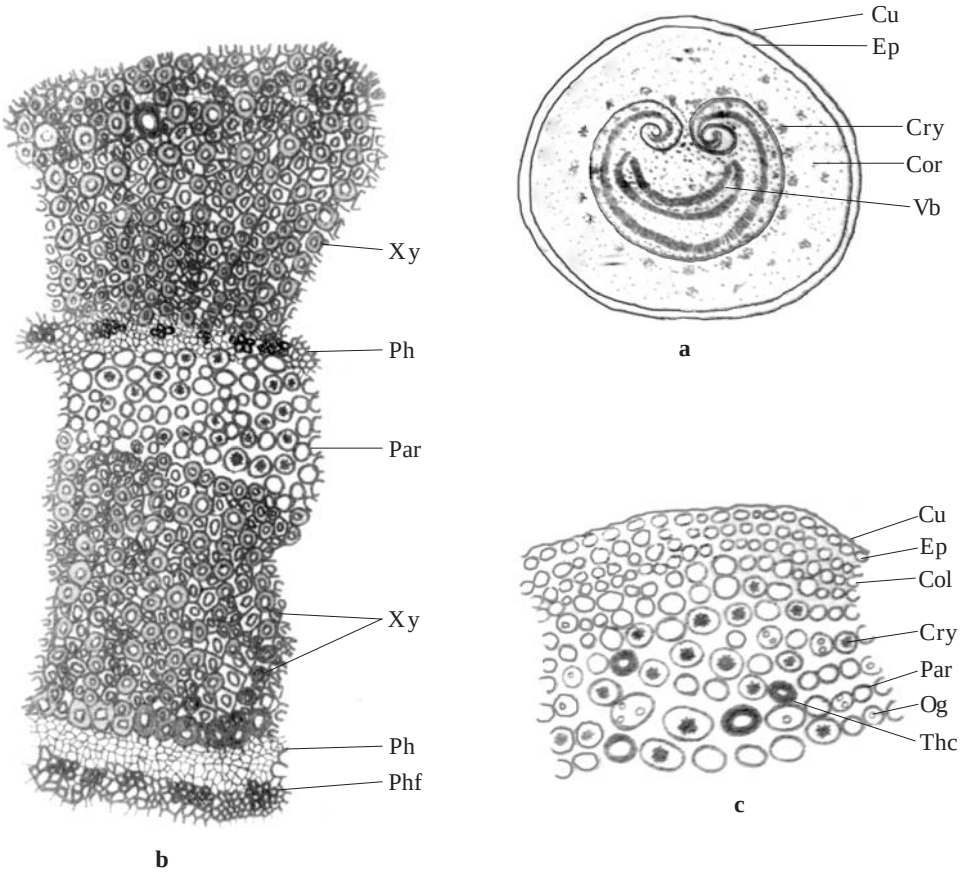

Fig. II **a - c** *Salvadora persica* Linn. - Microscopical characterers - Leaf petiole

a) T.S. of the petiole of leaf (semi diagrammatic) **b**) Vascular bundle of petiole enlarged
c) Portion of petiole enlarged

Cu. Cuticle **Ep**. Epidermis **Cry**. Crystal **Cor**. Cortex
Vb. Vascular bundle **Col**. Collenchyma **Par**. Parenchyma **Og**. Oil Globule
Thc. Thick walled cell **Xy**. Xylem **Ph**. Phloem **Phf**. Phloem fiber

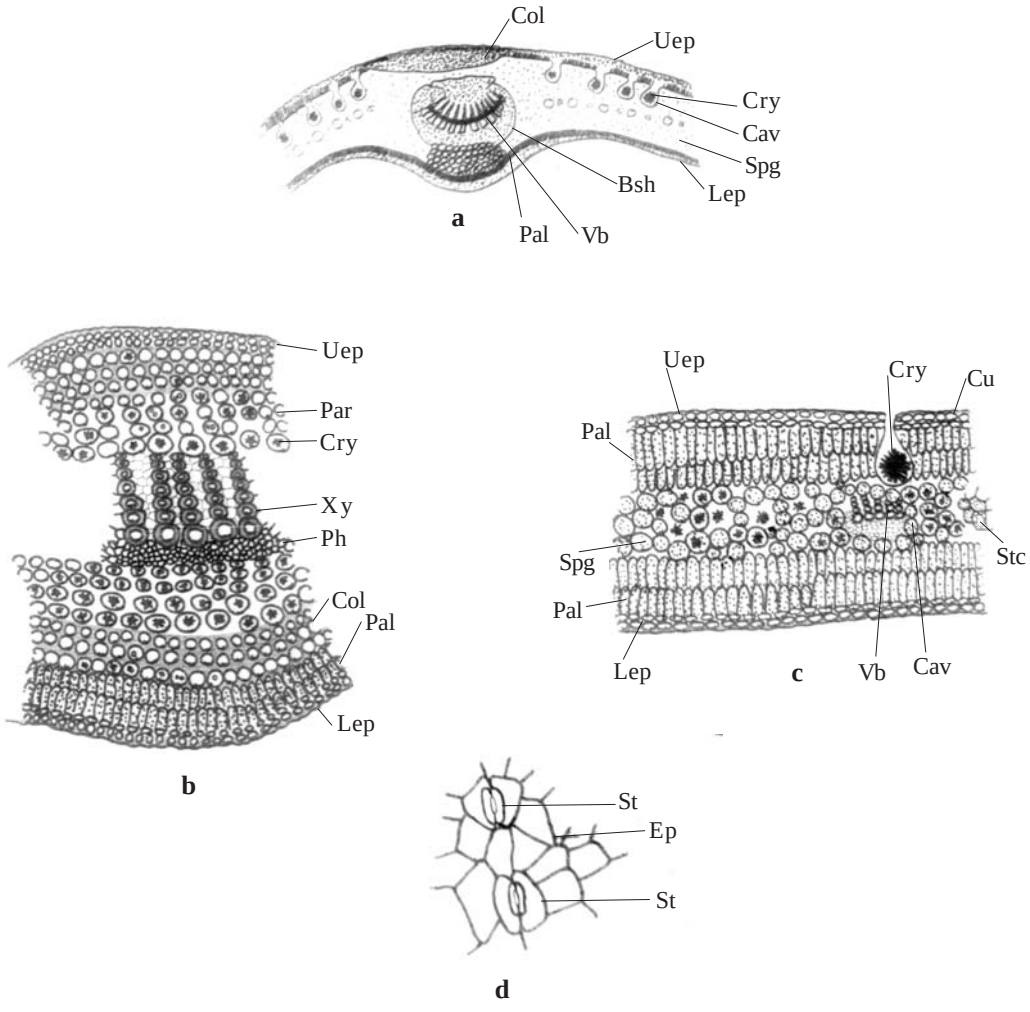

Fig. IV. **a - d** *Salvadora persica* Linn. - Microscopical characterers - Leaf

a) T.S. of the leaf (semi diagrammatic) **b**) TS of the leaf through midrib region enlarged **c**) TS of the leaf through laminar region showing double layered palisade parenchyma and cavity with a crystal **d**) Surface view of epidermis with stomata

Col. Collenchyma **Uep**. Upper epidermis **Cry**. Crystal **Cav**. Cavity
Spg. Spongy parenchyma **Lep**. Lower epidermis **Bsh**. Bundle sheath **Vb**. Vascular bundle
Pal. Palisade parenchyma **Par**. Parenchyma **Xy**. Xylem **Ph**. Phloem **Cu**. Cuticle
Stc. Stone cell **St**. Stomata **Ep**. Epidermis

groups of polygonal stone cells are also present in between the mesophyll tissue. Pits are prominent in the lumen of the stone cell. In the lower midrib region 2 layers of palisade tissue is present and it has been extended to laminar region.

Powder study

Powder, light green in colour with pleasant odour with sweet taste; the structures observed under the microscope were fragments of - epidermal cells; polygonal epidermal cells; parenchyma cells with clustered crystals of uncertain chemical composition; spongy parenchymatous tissue; polygonal, stone cells with broad lumen, pits inside the lumen; elongated, thick-walled (highly lignified) phloem fibers where some fibers are long and some are short; epidermal cells (surface view) with stomata and spiral xylem vessel.

Diagnostic characters

Presence of - light green, lanceolate leaf with wavy margin; abundant clustered crystals of uncertain chemical composition encircling the vascular bundle in midrib region, petiole of the leaf and in laminar region; polygonal stone cells in the mesophyll region; clustered crystals in the mesophyll tissue in a large cell (in a cavity like structure - Fig. IVc); cresentic vascular strand where ends are inwardly directed with xylem including well developed inter-xeylary phloem with phloem fibers in the petiole region (Fig. III a&b); rubiaceous stomata only on the lower side of the leaf; layered epidermal cells on both sides of the leaf and 2 to 3 layered palisade tissue in the laminar region on both sides where it is extended on the lower side of the midrib region.

Measurements of different cells and quantitative ratio have been recorded (Table 1 & 2).

TABLE 1

Measurements of different cells in microns

1. Epidermis	15 - 20 - 35 x 10 - 12 - 30
2. Collenchyma	25 - 35 - 40 x 15 - 30 - 35
3. Parenchyma	20 - 25 - 35 x 15 - 18 - 30
4. Xylem	25 - 35 - 45 x 20 - 30 - 40
5. Phloem	10 - 15 - 20 x 8 - 12 - 15
6. Palisade tissue	20 - 25 - 40 x 15 - 20 - 25
7. Spongy tissue	30 - 38 - 40 x 25 - 35 - 38
8. Stone cell	25 - 30 - 38 x 20 - 25 - 30

TABLE 2

Qnantitative ratio of salvadora persica (leaf)

1. Stomatal Number	
Lower side	20 - 25 - 38
Upper side	15 - 18 - 20
2. Palisade Ratio	8 - 12 - 15
3. Vein islet Number	18 - 22 - 24

Summary

In this paper, macro, microscopical characters, therapeutic uses and diagnostic characters like presence of clustered crystals of uncertain chemical composition both in petiole and leaf, clustered crystals in a large cell (in a cavity like structure), double layered epidermal cells in laminar region on both sides, cresentic vascular strand inwardly directed and xylem including well developed interxylary phloem with well developed phloem fibers, groups of polygonal stone cells with pits inside the lumen are being highlighted, which helps in identifying the drug *Salvadora persica* either in fresh form or in dry form.

Acknowledgements:
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ROLE OF *ASVAGANDHA* AND *PUNARNAVA* IN *AJASRIKA RASAYANA*

B.R. Shetty, Kanchana Srinivasan and P.P.N. Bhattathiri*

Abstract : *Rasayana* therapy in the health promotion of the vulnerable infants and children has been much explored in the ancient classics. This paper describes the efficacy of *asvagandha* and *punarnava* as *ajasrikarasayana* that promotes the growth in children.

Introduction

Healthy children are the wealth of a nation. Unhealthy and weaker children are liabilities to the nation and hurdles to the socio-economic progress of the country. *Ajasrikarasayana*, one of the many classifications of *rasayana*, is a non-pharmacological substance and it is said that constant use of such diet produces specific *rasayana-prabhava* in the body[3]. Drugs that are mentioned under this heading include *asvaganddha* (*Withania somnifera* Dunal), *punarnava* (*Boerhaavia diffusa* Linn.), etc. Regular consumption of these drugs in the *ahara* improves digestion, absorption and metabolism, provides extra nutritional value and enhances the immune system of the body.

Materials and methods

Forty children of both sexes in the age group of 8-12 years with minor nutritional deficiencies and no known physical or mental handicap were selected from an orphanage in Madras. A thorough clinical examination supplemented by X-ray, Mantoux and basic laboratory investigations was done to rule out major illnesses. The selected children were also homogenous receiving the same diet and living in the same environment. They were randomly allocated to three groups.

The first group received purified and powdered *asvagandha* at the dose of 2g per day. The second group received a mixture of *asvagandha* and *punarnava* powdered in equal ratio at the dose of 2g per day. The third group was given placebo which consisted of 2g Lactose powder. All the groups were given 100 cc of milk as *anupana*. The duration of treatment was 60 days.

The following anthropometric measurements viz. height, weight, chest circumference, handgrip and blood investigations such as

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haemoglobin, total proteins, serum albumin, A/G ratio, etc. were done initially and at the end of 60 days.

Results and discussion

The initial and final mean values of the groups and the percentage of increase/decrease for each parameter are detailed in Table 1 and 2 respectively. The following points are noted:

1. In weight, the *asvagandha* group had registered greater percentage of increase.
2. In handgrip, both the drug groups had fared better than placebo, having increased the handgrip, both left and right. The combination had fared better than the single drug.
3. In haemoglobin, the *asvagandha* had shown the desired and marked percentage of increase of nearly 6g.
4. In total proteins, which have a direct bearing on the growth factor, the *asvagandha* group had shown the greater percentage of increase than the other groups.

TABLE 1

Initial and final mean values of various parameters

Sl. No	Anthropometric		*Asvagandha* (13)		*Asvagandha* and *Punarnava* (15)		Placebo (12)	
			I	F	I	F	I	F
1.	Weight (kg)		25.25	26.14	25.25	25.79	25.10	25.69
2.	Chest circumference (cm)		61.38	61.83	61.77	61.87	60.50	60.69
3.	Handgrip (kg)	R	9.67	10.24	7.33	9.32	8.89	8.71
		L	9.60	10.94	7.67	9.69	8.59	9.00
4.	Haemoglobin		9.70	10.26	10.88	10.50	10.05	10.10
5.	Total protein		6.77	7.14	7.05	7.09	6.98	6.91

TABLE 2

Percentage of increase/decrease between initial and final values

Sl. No	Anthropometric	*Asvagandha* (13)	*Asvagandha* and *Punarnava* (15)	Placebo (12)
1.	Weight (kg) % of increase	3.52	2.14	2.35
2.	Chest circumference (cm) % of increase	0.00	0.16	0.31
3.	Handgrip (kg) % of increase	13.96	26.34	4.77
4.	Haemoglobin % of increase/decrease	5.77	-3.49	0.50
5.	Total protein % of increase/decrease	5.46	0.57	-1.00

The results indicate that *asvagandha* per se is better than the combination of *asvagandha* + *punarnava* in promoting growth factors viz. weight and total protein. The awareness of the relation of nutrition to sound physical and mental development of children in their early childhood is greater at present than at any time. Ancient ayurvedic scholars and physicians knew the importance of nutrients like vitamins and minerals for promoting growth and imparting immunity against diseases[4]. This is well explained in the classification of *Ahararasayana* or *Ajasrikarasayana*. Constant use of such diet produces specific *rasayana-prabhava* in the body.

It is well explained in ancient ayurvedic texts that *asvagandha* with milk nourishes aged people and children like rain does to crops[5]; the findings of the clinical study substantiate the same.

Ayurveda classifies drugs into two groups – a) drugs that give strength to normal human being (*svasth*) and b) drugs that relieve symptoms and cure diseases[6]. *Asvagandha* and *punamava* come under both the group due to their *rasa guna veerya vipaka* properties. They not only give strength and vigour to the body, but also normalise the vitiated *dosha*s and *dhatu*s of our body. *Punarnava* is *laghu* and *rooksha* while *asvagandha* is *laghu* and *snigdha*; so, *asvagandha* may act in *vata roga*s more effectively than *punamava*. The name *punarnava* itself indicates that it regenerates the body tissues[7].

Conclusion

Asvagandha, as noted by Bhavamisra is both *balya* and *rasayana*[8]. From the study it is found that *asvagandha* is very effective in promoting growth factors and the organizers of midday meals and free milk distribution to children of lower income group, nutritionist and manufacturers of baby foods should think to make use of these drugs as nutritional supplement.

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PHARMACODYNAMIC STUDIES OF *TERMINALIA BELLIRICA* FRUIT EXTRACTS

V.Z. Kotangale, V.P.Vadlamudi and S.R.Rajurkar*

Abstract: The aqueous extract of *Terminalia bellirica* was assessed for its effects on dog blood pressure and respiration, frog heart, rabbit duodenum, effect on Spontaneous motor activity (SMA) and the analgesic activity in mice indicated hypotensive, cardiac depressant, intestinal antispasmodic and Central nervous system (CNS) depressant effects.

Introduction

Plants not only form the source of food and fodder for man and animals, but also elaborate potent active principles with varied medicinal properties. The herbal remedies are economical and are within the reach of common man. About eighty per cent of the people in developing countries are dependent on traditional system of medicine for their primary health care needs (Fransworth, 1990). Out of 15,000 to 20,000 plant species of Indian flora, around 7000 plant species are used under traditional medicine (Pushpangandan, 1994). However, only a small portion of medicinal plants is acknowledged through scientific studies (Handa, 1996).

Materials and methods

Fresh fruits of *Terminalia bellirica* were processed to obtain 20 per cent cold aqueous extract. The aqueous extract was subjected to study its effects on blood pressure and respiration of anaesthetized dog, perfused frog heart and rabbit intestine, spontaneous motor activity and the analgesic activity in mice.

Dog blood pressure and respiration: - The effect of sterile aqueous extract on blood pressure and respiration of anaesthetized dog was studied using research kymograph as per the method suggested by Sheth et al. (1972). The extract was administered at the dose rate of 5, 10, 25, 50 and 100 mg/kg i.v. in two male and two female healthy mongrel dogs fasted overnight.

Frog heart: - Effect of aqueous extract on perfused heart was studied as per the method suggested by Burn (1952) The extract was infused at 0.1,0.2 and 0.5 ml dose level.

Rabbit intestine: - Preparation of isolated rabbit duodenum was employed as per the method suggested by Sheth et al. (1972). Two healthy adult New Zealand rabbits, fasted overnight were used for the study the extract was placed in a 10 ml tissue bath at 0.05, 0.1 and 0.2 ml

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levels. A total of four repetitions of the experiment were undertaken taking a fresh duodenal piece at each time.

Spontaneous motor activity (SMA): - For studying the effect of extract on SMA 24 healthy Swiss mice of either sex with the body weight of about 25g were divided into four groups each containing 3 male and 3 female mice. The 1st group served as control, which received 0.5 ml distilled water. The other three groups were administered the extract at the dose rate of 500, 1000 and 2000 mg/kg body weight. The extract was administered orally with gastric needle in volume not exceeding 0.5 ml per mouse. The SMA was recorded before treatment and at 0.5, 1, 2, 4 and 8 hour of post treatment keeping the entire group at a time in Photo-Actometer as per the method described by Sheth et al. (1972).

Analgesic activity: - Analgesic activity of the aqueous extract was assessed by using Eddy's hot plate as per the method suggested by Sheth et al. (1972). Twenty four Swiss mice weighing about 25g were divided in four groups, each containing three males and three females. The Group I served as control and administered with distilled water. The aqueous extract was administered at the dose rate of 500, 1000 and 2000 mg/kg body weight in Groups II, III and IV respectively orally with gastric needle in volume not exceeding 0.5 ml per mouse. The reaction time was recorded before treatment and at 0.5, 1, 2, 4 and 8 hr. of post-treatment.

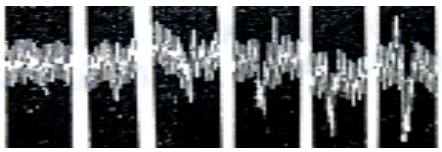
Results and discussion

The effect of aqueous extract of *Terminalia bellirica* at the dose rate of 5, 10, 25, 50 and 100 mg/ kg (iv) on anaesthetized dog found progressively decreased the blood pressure (Fig.I). The hypotensive response was not due to cholinergic involvement as it was not blocked by prior atropinization at the dose rate of 5 mg/ kg i.v.; it may be due to either direct relaxant effect on the smooth muscles of blood vessels or depressant effect on heart or both. The effect of aqueous extract at the dose rate of 5 to 100 mg/ kg (iv) on respiration of anaesthetized dog did not alter the respiration (Fig II).

The effect of aqueous extract of *Terminalia bellirica* on perfused frog heart is shown in Fig.III. There was decrease in systolic contraction of heart at 0.1, 0.2 and 0.5 ml doses of the extract. This might have resulted in decreased cardiac out put contributing to the fall in blood pressure.

The effect of aqueous extract at 0.05, 0.1 and 0.2 ml dose on isolated rabbit duodenum progressively reduced the intestinal motility (Fig. IV). The effect may be due to direct relaxant action on the smooth muscles of intestines. The observations also confirm the non-cholinergic mechanisms on smooth muscles as pointed out under the effect on blood pressure.

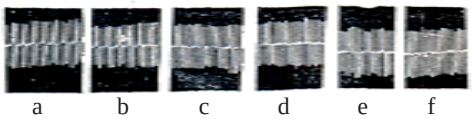
The effect of aqueous extract on Spontaneous Motor activity in Swiss mice is shown in Table (1). Following oral administration of the extract the SMA of the mice was lowered at 30 min and 4 hr intervals of post administration where the SMA varied from 66 to 80 and 49 to 73 per cent respectively in comparison to 100 per cent SMA at pre treatment with 500, 1000 and 2000 mg/kg oral doses. From 8 hr post-administration the SMA returned to near pre administration levels with 500 and 1000 mg doses. At 13 hr interval of post-administration the SMA with



a b c d e f

Fig. I. Effect of aqueous extract
on blood pressure of anaesthetized dog (i.v.)

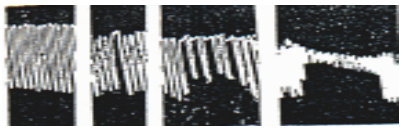
a. Normal; **b**. 5 mg/kg; **c**. 10 mg/kg; **d**. 25 mg/kg;
e. 50 mg/kg; **f**. 100 mg/kg



a b c d e f

Fig. II. Effect of aqueous extract
on respiration of anaesthetized dog (i.v.)

a. Normal; **b**. 5 mg/kg; **c**. 10 mg/kg; **d**. 25 mg/kg;
e. 50 mg/kg; **f**. 100 mg/kg

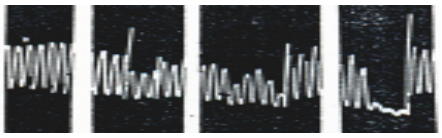


a b c d

Fig. III

Effect of aqueous extract on perfused frog heart

a. Normal; **b**. 0.1 ml; **c**. 0.2 ml; **d**. 0.5 ml



a b c d

Fig. IV

Effect of aqueous extract on isolated
rabbit duodenum (10 ml bath)

a. Normal; **b**. 0.05 ml; **c**. 0.1 ml; **d**. 0.2 ml

2000 mg/ kg dose was 136 per cent. The SMA of the control mice was unaltered throughout the observation period. The reduced SMA may be due to CNS depressant effect of the fruits of *Terminalia bellirica*.

The mean reaction time of mice to the thermal stimuli following oral administration of the fruit extract at 500, 1000 and 2000 mg/kg doses is shown in the Table (2). The reaction time to thermal stimuli in control group mice and those treated with 500 mg/kg of the fruit extract was not significantly variable at all the post treatment intervals as compared to the respective pre-treatment reaction times. The mice treated with 2000 mg/kg dose showed significantly prolonged reaction time.

Conclusion

The literature on Indian Medicinal Plants also

TABLE 1

Effect of ethyl acetate extract on pontaneous motor activity (SMA) of mice

Time	SMA[a]	Propylene glycol (CONTROL)	Dose of extract mg/kg orally[b]			Correction Factor
			500	1000	2000	
BEFORE TREATMENT	Observed	220	245	280	205	-
	Per cent		100	100	100	
AFTER TREATMENT						
30 min	Observed	205	277	245	162	0.93
	Corrected		211	228	151	
	Per cent		86	81	73	
1 hr	Observed	229	213	210	133	0.96
	Corrected		204	201	128	
	Per cent		83	72	62	
2 hrs	Observed	258	190	197	118	0.85
	Corrected		162	167	100	
	Per cent		66	60	49	
4 hrs	Observed	226	217	231	124	0.97
	Corrected		210	224	120	
	Per cent		86	80	59	
8 hrs	Observed	271	292	324	217	0.81
	Corrected		237	262	176	
	Per cent		97	94	86	

a - SMA for 5 Minttes; b - Six mice were used for each dose

TABLE 2

Analgesic activity ethyl acetate extract in mice

Group	Dose of extract	Mean reading of analgesiometeter					
		Pretreatment	30 min	1 hr	2 hrs	4 hrs	8 hrs
I	0 mg/kg	28.3	30.8	28.2	29.8	28.7	31.5
	(Control)	(3.36)	(3.09)	(3.74)	(3.79)	(3.86)	(2.95)
II	500 mg/kg (2.98)	31.0 (2.70)	31.7 (2.49)	30.5 (3.23)	38.7 (2.87)	32.2 (3.94)	31.5
III	1 000 mg/kg	29.5	28.8	35.5	52.0*	36.7	29.3
		(2.97)	(3.67)	(3.87)	(4.86)	(5.68)	(3.03)
IV	2000 mgJkg	28.5 (2.81)	31.8 (3.18)	45.2* (2.52)	53.3* (4.85)	54.3* (5.14)	30.8 (3.94)

* (P<0.01); Figures in paranyhesis refer to SE

indicates narcotic effect of the fruits of *Terminalia bellirica* (Sawant, 1974; Nadkami, 1976). The lowered SMA and analgesic effect as recorded in the present study may be due to narcotic effect of the fruit extract.

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EXCERPTS FROM CHIKITSAMANJARI – XLIV

Unnikrishnan, P.*

Abstract: *Masoorika* (lesions of Pox fever) is characterized by formation of lentil-shaped blisters all over the body that later get converted to pustules. Small pox and chicken pox were very common in olden days and mortality or disability rate in cases of Chicken pox was high. In this chapter, the signs and symptoms and different modalities of treatments of *masoorika* are dealt with. The characteristics of *visphota* and *seetapitta* and their treatments are also explained.

TREATMENT OF *MASOORIKA*

Eruptions containing fluid as in the case of blisters which are the size of lentil, spread all over the body associated with high fever is known as *masoorika.* Based on the etiological factors, there are nine types of *masoori*. Deranged singular *dosha*s cause three types, duel *dosha*s three types and simultaneous combined vitiation of all *dosha*s one type; vitiated blood causes another type, and exogenous (*agantu*) in origin by inhalation of toxic trees or flowers gives rise to another type.

The prodromal symptoms of *masoorika* are fever, dryness of mouth, pressing pain, segregation of joints, anorexia, horripilation, ophthalmopathy and catarrhal inflammation. Generalized burning, tremor, severe pain, diarrhea, intense thirst, hiccough, anorexia, cough and unconsciousness, internal rupturing of blisters and extensive formation of scar tissue associated with *masoorika* are said to be fatal.

At the time of onset of prodromal symptoms the treatment of *masoorika* consists of fasting, induction of emesis by a *kashaya* prepared from *yashtimadhuka* (*Glycyrrhiza glabra*), *nimbatvak* (bark of *Azadirachta indica*) and *ambu* (*Plectranthus vettiveroides*) to which a small quantity of sugar is to be added. Purging by consuming fine powder of *trivrit* (*Operculina turpethum*) or *avipattichoorna* is also advised. Jaggery mixed with lemon juice if consumed in early morning relieves pain and other discomforts associated with *masoorika*. *Rudraksha* (*Eleocarpus ganictrus*), mixed with fresh cow's milk, taken in the morning has similar effect. This is a secret drug.

A *kashaya* prepared with the tuber of *kadali* (*Musa paradisiaca*) relieves *masoorika*. A decoction made out of the following is also effective in *masoorika*.

Sariba	*Hemidesmus indicus*
Madhuka	*Glycyrrhiza glabra*
Usira	*Vetiveria zizanioides*
Yasha	*Tragia involucrata*

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Chandanam	*Santalum album*
Parpata	*Hedyotis corymbosa*

Consumption of *Jivantyadi kashaya* (cross ref. *Pramehapitaka*/15) is also effective in *masoorika*.

A *kashaya* prepared from the following relieves *vatasonita* - fever caused by deranged *pitta* and *rakta*, and diabetes caused by polluted *pitta*.

Veppintol	*Azadirachta indica*
Manjal	*Curcuma longa*
Patha	*Cyclea peltata*
Jalada	*Cyperus rotundus*
Atakotinpala	*Holostemma ada-koedien*
Paneeyayugmam	*Nelumbo nucifera* *Nymphya alba*
Nelli	*Emblica officinalis*
Tanni	*Terminalia bellirica*
Katukka	*Terminalia chebula*
Patavalam	*Trichosanthes lobata*
Amrita	*Tinospora cordifolia*
Sariba	*Hemidesmus indicus*
Yashti	*Glycyrrhiza glabra*

The water should be reduced to one eighth and honey and sugar is to be added at the time of consumption.

Udumbaraphala (fruits of *Ficus racemosa*) and *yashti* ground to a paste and mixed with milk on consumption relieves *masoorika*. Expressed juice of *brahmi* (*Bacopa monnieri*) consumed with sugar prevents *masoorika*. Irrigation and external application with drugs that have cold (*seeta*) potency, capable of normalizing deranged *pitta*, are prescribed. Apply *doorvaghrita* detailed in the treatment of *visarpa*.

A *kashaya* prepared from the following mixed with *kati* (first washing of rice) shall be consumed as a preventive measure.

Dhatri	*Emblica officinalis*
Chandanam	*Santalum album*
Urvaru	*Cucumis sativus*
Sitagunjaphalam	*Abrus precatorius*

Root of *pavutta* (*Morinda pubescens*), made to a paste in the juice of *matangapada* (*Elephantopus scaber*), on external application relieves fever; continuous application of this paste prevents formation of blisters. Fine powder of *anachuvatu* (*Elephantopus scaber*) *paimanjal* (*Curcuma longa*) and *marachoora* (*Lagenaria siceraria*), mixed with coconut milk and reduced, on local application heals blisters. Intake of milk medicated with garlic or mixed with juice of *brahmi* in the morning is effective.

Application of a paste made out of *sarja* (*Veteria indica*) mixed with the expressed juice of *sigru* (*Moringa oleifera*) on evolving blisters averts further development of blisters. Local application of the *kashaya* of *asvagandha* (*Withania somnifera*) mixed with mercury is also effectual.

Intake of cooked *sivanama* (*Emblica officinalis*) and juice of *cheekkizhangu* with sour buttermilk prevents formation of *masoorika*. *Patakkizhanu* (*Cyclea peltata*), mixed with *anayateerasa* (*Elephantopus scaber*) shall be taken to heal blisters. Healing of blisters is promoted by local application of *manjal* with the juice of *appa* (*Ageratum conyzoides*) in a bronze dish. Medicated oil prepared from the juice of *dasapushpa** as liquid component and drugs specified in *Eladigana* (ref A.H. Su. 15) as solid component heals blisters like hot water irrigation for sprouting seeds.

**Dasapushpa*:

Puvankuruntila	*Vernonia cinerea*
Muyalchevi	*Emilia sonchifolia*

Vishnukranti	*Evolvulus alsiniodes*
Doorva	*Cynodon dactylon*
Mukkutti	*Biophytum sensitivum*
Uzhinja	*Cardiospermum halicacabum*
Tirutali	*Ipomoea sepiaria*
Nilappana	*Curculigo orchioides*
Kanjunni	*Eclipta prostrata*
Cherupula	*Aerva lanata*

Irrigation on blisters by water boiled with *maricha* (*Piper nigrum*) and rice is prescribed; application of castor oil in the eye is indicated. Intake of *hastapadika* (*Elephantopus scaber*) mixed with milk, its external application all over the body, tie its leaves on the right ear, etc. are also recommended.

The following *kashaya*, consumed with honey and sugar relieves thirst associated with *masoorika*.

Varvata-pallavam	Leaves of *Homonoia riparia*
Utpalanalam	Stem of *Nymphea alba*
Tamaraver	*Nelumbo nucifera*
Kazhikar	*Cyperus esculentus*
Madhukam	*Glycyrrhiza glabra*
Darbha sipha	*Desmostachya bipinnata*

Two *kashaya*s prepared from the following has similar action.

1)	*Parpata*	*Hedyotis corymbosa*
	Sevya	*Vetiveria zizanioides*
	Hima	*Santalum album*
	Ambuda	*Cyperus rotundus*
	Yashti	*Glycyrrhiza glabra*
	Mudga	*Vigna radiata*
	Patola	*Trichosanthes lobata*
2)	*Madhuka*	*Glycyrrhiza glabra*
	Arjuna	*Terminalia arjuna*
	Jamboo-pallavam	tender leaves of *Syzygium cumini*
	Hima	*Santalum album*
	Ambu	*Cyperus rotundus*

Drinking of the *kashaya* prepared from the following, mixed with honey relieves eight types of *masoorika*s.

Sundhi	*Zingiber officinale*
Bala	*Sida rhombifolia* ssp. *retusa*
Nimba	*Azadirachta indica*
Patola	*Trichosanthes lobata*
Kushtha	*Saussurea lappa*
Dhanyaka	*Coriandrum sativum*
Amalaka	*Emblica officinalis*
Musta	*Cyperus rotundus*

The patient should consume expressed juice of *alam* (*Ficus benghalensis*) with gingilly oil (both 24 ml) and walk around the house for a few minutes on the previous day of taking bath; and to eradicate the foul smell in the house, fumigate with the bark of *kimsuka* (*Butea monosperma*).

Application of clarified butter or sesame oil medicated with *kashaya* of *ksheerivriksa* (*Ficus racemosa, Ficus microcarpa, Ficus religiosa* and *Ficus benghalensis*) as liquid component and their buds as solid component after the lapse of twenty days is advised. The patient should not take bath for twenty days from the onset of fever. On the day of bath, only cold water shall be used and after bath, the body should be applied with sandalwood paste. Worship to gods like Siva, etc., chanting hymns, etc. are also suggested; if the symptoms of *masoorika* appear, consume suitable dose of *Avipattichoorna* for purging. Purging is an important treatment in the management of *visarpa*, *visphota* and *masoorika*.

TREATMENT OF *VISPHOTA*

Fever, severe burning sensation, lassitude, and formation of blisters all over the body due to vitiation of *pitta* are the general features of *visphota*; here, fasting and purging are the initial treatment. Intake of *Avipattichoorna* and *Amritottaram kashaya* is advised.

Consumption of a *kashaya* prepared from the following cures *visphota*.

Nimba	*Azadirachta indica*
Amrita	*Tinospora cordifolia*
Abda	*Cyperus rotundus*
Dhanyaka	*Coriandrum sativum*
Yasha	*Tragia involucrata*
Bhoonimba	*Andrographis paniculata*
Parpata	*Hedyotis corymbosa*
Vasa	*Justicia beddomei*
Vara	*Terminalia chebula*
	Emblica officinalis
	Terminalia bellirica
Patola	*Trichosanthes lobata*

External application of milk medicated with *chandana* relieves burning; also, application of *Satadhouta ghritha* and *Gopatmajadi ghrita* are advised.

Mix butter with expressed juice of *tirutali* (*Ipomoea sepiaria*) and heat to remove moisture; apply this preparation topically for the relief of ulcers in the mouth and large blisters. Prepare a paste of *attittoli* (*Ficus racemosa*) and *chandana* in the expressed juice of *tirutali*; this preparation mixed with butter on application relieves *visphota*; the root of *kanjiram* (*Strychnos nux-vomica*) ground to a paste mixed with butter can also be applied.

Prepare a paste with the following in milk, add *ghrita* and apply on blisters.

Ksheeridruma	buds of -
mottu	*Ficus racemosa*
	Ficus microcarpa
	Ficus religiosa
	Ficus benghalensis
Karuka	*Cynodon dactylon*
Chandanam	*Santalum album*
Sariba	*Hemidesmus indicus*
Madhukam	*Glycyrrhiza glabra*
Padmakinjalkam	*Nelumbo nucifera*
Ramacham	*Vetiveria zizanioides*
Iruveli	*Plectranthus vettiveroides*

Intake of *Tiktaka ghrita* is advised for the relief of *visphota*. The treatments indicated for *visarpa* and *masoori* can also be followed.

Fine powder of *nellikka*, *patavalam* and *mudga*, mixed with ghee shall be applied. Application of *Panchavalkadi tailam* added with one-third *ghrita* and expressed juice of *karuka* and *parpata* as liquid is also effective.

Doorva ghritha, detailed in *Visarpa* shall be consumed or applied locally. Smearing *bhasma* prepared with cow dung collected from forests on ripened blisters and on the bed of the patient is suggested.

TREATMENT OF *SEETAPITTA*

Extensive and numerous circularly elevated blood-coloured lesions of skin caused by polluted *pitta* are called *seetapitta* (wheals). Vitiated *pitta* and *kapha* cause itching also. The disease is also known as *amlapitta*.

Purge with *Avipatti choorna* or *Manibhadram gulika* (detailed in drugs for purgation); consume *Amrithotharam kashayayam* (detailed in *jvara chikitsa*). Prepare medicated oil with the expressed juice of *chittamritu* (*Tinospora cordifolia*) and milk as liquid component and fine powder of the following as solid component.

Chandanam	*Santalum album*
Irattimadhuram	*Glycyrrhiza glabra*
Kottam	*Saussurea lappa*
Kadalippazham	*Musa paradisiaca*

Application of the above oil on the head relieves *seetapitta*. Prepare a medicated *yamaka* (oil-ghee combination) of *Panchavalkadi* and applied. The solid components of *Pindataila* [*manjishta* (*Rubia cordifolia*), *sarjarasa* (*Veteria indica*) *sariba* (*Hemidesmus indicus*) and *madhoocchista* (bee's wax)] and the liquid components of *Balaguluchyadi* [*bala*, *guloochee* (*Tinospora cordifolia*) and *surapadapa* (*Cedrus deodara*) is to be prepared as *yamaka* and apply on the body only downwards from the neck.

A *kashaya* prepared from the following relieves skin diseases and *seetapitta* like nectar that brings longevity to gods.

Aargvadha	*Cassia fistula*
Amrita	*Tinospora cordifolia*
Pathya	*Terminalia chebula*
Khadira	*Acacia catechu*

A paste made out of *sariba, chandana, kushtha* with milk, on topical application relieves *seetapitta* instantaneously. The treatment of *seetapitta* is along the same lines as that of *veesarpa*.

In case itching persists, external application of *Doorvadi tailam* is prescribed. Intake of a *kashaya* prepared out of *chittamritu, chandana, veppintol* and *kotuttuva* (*Tragia involucrat*) is also recommended.

Local application of a paste of the following prepared in milk relieves *seetapitta* or *himapitta*. Alternatively, instead of milk, juice of sour drugs can also be used as the liquid medium.

Amrita	*Tinospora cordifolia*
Chandanam	*Santalum album*
Usira	*Vetiveria zizanioides*

In cases of *kakshya* (a kind of skin disease) and *visphota*, treatment of *pitta* is to be followed. In this disease, fever causes precipitation of *tina*-size (*Setaria italica*) eruptions and it is termed as *kshudramasoorika* (chicken pox). Here the treatment is purging by fine powder of *trikolpakkonna* (*Operculina turpethum*) and *katukka* in jaggery. When the blisters, ulcers, etc. heal, there exists black scar and to restore the skin to its normal color, the following applications are effective:

- Fine powder of *gajasthi* (bone of elephant), *gairika* (red ochre) and *nisa* (*Curcuma longa*) mixed with honey. A paste made out of elephant's bone alone.
- Fine powder of *nellikka* and *tila* (*Sesamum indicum*) - each one part, and ghee two parts.

A *kashaya* prepared from the following on consumption, relieves blisters.

Trayamana	*Gentiana kurroo*
Uttama	*Terminalia chebula*
	Emblica officinalis
	Terminalia bellirica
Draksha	*Vitis vinifera*
Kataka	*Strychnos potatorum*

Another *kashaya* prepared from the following, consumed with sugar also has similar action.

Dhatri	*Emblica officinalis*
Khadira	*Acacia catechu*
Nimba	*Azadirachta indica*
Ambu	*Plectranthus vettiveroides*
Chandanam	*Santalum album*

Chandanaparpatakadi kashayam, earlier mentioned also can be consumed.

Blisters are relieved by intake of a *kashaya* prepared from the following.

Nimbavalka	*Azadirachta indica*
Amrita	*Tinospora cordifolia*
Dhatri	*Emblica officinalis*
Satala	*Bacopa monnieri*

Another *kashaya*, prepared by *triphala* (*Terminalia chebula, Emblica officinalis, Terminalia bellirica*) and *nimba* has similar properties. A paste prepared from the following in milk added with ghee on application relieves blisters.

Chandanam	*Santalum album*
Sariba	*Hemidesmus indicus*
Lodhra	*Symplocos cochin-chinensis*
Usira	*Vetiveria zizanioides*
Padmakesaram	*Nelumbo nucifera*
Madhukam	*Glycyrrhiza glabra*
Ksheerisringa	*Ficus racemosa*
	Ficus microcarpa
	Ficus religiosa
	Ficus benghalensis
Udakakanda	*Nelumbo nucifera*
	Nymphya alba
	Nymphaea nouchali
	Kaempferia rotunda

Consumption or application of *Doorvaghrita*, detailed in the treatment of *veesarpa*, is effective.

BRHACCHARIRAM
(Sanskrit)
Vaidyaratnam P.S. Varier
Part I - 1942, Part II - 1969

"It was fifteen years ago, when I visited Kottakkal, for the first time, to preside over the 39th session of the All India Ayurvedic Congress to which the Arya Vaidya Sala had played a generous host, that I had first come across Shri P.S. Varier's Sanskrit treatise on anatomy, *Brhacchariram*. As I went through its pages, I was struck by the thoroughness and excellence of the work. Anatomy, unlike fiction, poetry, philosophy, or popular science, does not offer a fascinating reading by itself. Nor is Sanskrit a language which, considering contemporary linguistic movements and trends, among different states of India, towards according official as well as classical status to every provincial language in the country, can command a readership large enough to encourage or inspire an author to use it as a vehicle of expression with the object of popularizing the treatise.

And yet the aptness of the diction, the lucidity of the expression, the simplicity of the language and the clarity of the style, used throughout the work, made for an interesting reading of the contents originally intended to be merely instructive. I should not forget to mention four more desirable factors: the illustrations are profuse and clear, the type is bold, the paper, printing and the general get-up are very good. Above all the coinage of the new terms reveals a pleasing accuracy, which masterfully conveys the intended anatomical picture to the mind of the reader. I will place this book among the best of its class in India, worthy of being prescribed as a standard textbook of anatomy for the Ayurvedic colleges in the country."

- From the foreword by Pandit Shiv Sharma