ANATOMICO-PHYSIOLOGICAL STUDY OF MEDA, MEDOVAHA SROTAS WITH THEIR FUNDAMENTAL EXPLORATION

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ABSTRACT

Ayurveda describes the anatomy and physiology of the human body clearly in terms of Tridosha, Dhatu, Malas and Srotas, etc. Human body is considered as a channel system constituted of innumerable channels designed for varied functions. The importance of Srotas has been described by Charaka Acharya in an entire chapter ‘Srotos Vimāna’. Manifestation of a disease in the body results from a defective srotas which favors the dosha-dushya sammurchhana. Medovaha srotas if vitiated causes medo dushti which may be expressed as Prameha poorva roopa lakshana. This necessitates a thorough knowledge of the basic concepts. Medodhara Kala (Omentum or deep fascia), Parenephric tissue, Medoagni (Physiology of thyroxin), Medodhatu utpatti (fundamental of adipose tissue), Vrika or Kati (fundamentals of Kidney and Pelvic region). The present study aims at an understanding of Medo Dhatu and Medovaha srotas, its moola sthana and their fundamental exploration. Acharya Charakaa has broadly described thirteen types of srotas, while Sushruta mentioned eleven pairs of srotas. Both Charakaa and Sushruta quoted medovaha srotas, which are self-explanatory to explicate the importance of medovaha srotas. Medo agni karm: Essentially all aspects of fat metabolism are also enhanced under the influence of thyroid hormone. This also increases the free fatty acid concentration in the plasma and greatly accelerate the oxidation of free fatty acid by the cells. Increased thyroid hormone decreases the concentration of cholesterol, phospholipids and triglycerides in the plasma. Decreased thyroid secretion greatly increases the plasma concentration of cholesterol, phospholipids and triglycerides and almost always causes
excessive deposition of fat in the lever as well.[1]

INTRODUCTION
Srotas is a pathway (Channel) that carries substances or energy from one place to another in the human body. Sushruta Mentioned that the channels of circulation are present in intra-cellular, intra-cellular and extra cellular spaces of the human body. Acharya charaka has broadly described thirteen type of srotas, While Sushruta mentioned eleven pair of srotas. Both Charaka and Sushruta quoted Medovaha Srotas, While are self explainatory to explicate the impotance of Medovaha Srotas. According to Sushruta medovaha srota-dushti (vitiation) lakshanas are sweda agaman (excessive sweating), snigdha angatta (Oily appearance of the body), talu shosha (dryness of the palates), sthaulya (obesity) shophataa (edema) and pipasa (thirst). According to charakaa, the vitiation of medovaha srotas will lead to prameha purvarupas. All these character described by Sushruta are due to hyper- or hypo-secretions of epinephrine, norepinephrine, estrogen, leptin, insulin, androgens, growth hormone, ADH and aldostrone, thyroid hormone, glucagon, amylin, GIP, GLP-1, epinephrine, cortisol and insulin. From physiologic point of view, all these character either described charakaa or sushruta seem to be deseases or conditions related to hormonal imbalances.

When Tridosha, Agni functioning, Sapta dhatu formation and excretion of mala, mutra, sweda, all these are in its balanced state, concept of mutual interdependency is also seen between dosha, dhatu and mala which known as dosha, dushya, asraya, asrayi bhava.[2]

In the Asthi vayu resides, in the sweda and rakta, pitta resides and in the remain dhatus and mala sleshman resides in intimate relation as the asraya (residence, container) and asrayi (resident, content) respectively.

AIMS AND OBJECTIVES
- To compile the literatures about Medo Dhatu and ‘Medovaha Srotas’ from classical and their related literature.
- To assess the appropriate position and structures related to Medo Dhatu and Medovaha Srotas.
- To explore the fundamental aspect of Meda and Medovaha Srotas Critical study will be done.
DISCUSSION

1 fundamental aspects of meda dathu- Medas is one among the saptadhatu, the fourth dhatu formed from the essence of āhāra rasa and is a mātruja bhāva, i.e. having a maternal origin. The sneha bhāva (unctuousness) imparted by the medo dhatu is its principle function. “Medyati snihyati iti meda:”[3] The Sanskrit word medas with its root ‘mid’ refers to snehana i.e. to oleate. Sneha is a quality which imparts softness due to its kledana (moisturizing) property. Synonyms of medas include mamsatejas, asthikrit, vapā, vasā etc.[4] Rasa (the essence of food) when attains solidity converts to mamsa which again when acted upon by mamsa dhatvagni; dominated by agni, ap and snigdha is transformed into medas.

[5] Medas is said to be formed in medodhara kalā and the action of medo dhātvagni in turn transforms it to Asthi as essence, Snāyu – Sandhi as updhatu and Sweda as mala. Though the quantity of dosha or dhatu cannot be measured always because of variable nature, the pramāna of medas as two Swa-Anjali is taken normal. While describing medodhara kala, Susruta Acharya explains that in all living beings medas is found in udara and anu asthi. He also opines that it is found as medas mixed with rakta in bones other than the large ones. Medas, hence, is inferred as ‘Lipids’ and Meda Dhatu as adipose tissue. The special function of medas is to provide unctuousness and firmness to the body, nutrition to the bones.

[6] Vagbhata Acharya specifies unctuousness of body and eyes in addition to the above stated functions.[7] The function of medas is also stated as to bring about corpulence and strength due to its guru - snigdha nature.[8] Medas is the dhatu which undergoes mridu pāka or khara pāka and gets accordingly differentiated to sira and snayu respectively. Hence it is also said as being nutritive to Sukshma snāyu.[9] All these are assigned as the functions of medo dhatu when in equilibrium state, both quantitatively and qualitatively. The purity of dhatu is accounted through sāra pareeksha. The person endowed with meda sārata has unctuousness in complexion, voice, eyes, hand, hair, skin, nails, teeth, lips, urine feces etc.

The function of srotas is transportation of dhatu (‘Sravanāt srotānsi’), especially those that are in the process of transformation. The nutrition of a particular dhatu is transported through its respective srotas alone. Hence the colour of srotas is said to be similar to the dhātus they carry.
Types of Srotas (CharakaAcharya):

<table>
<thead>
<tr>
<th>Bahirmukha srotas: 9 (+3 in females)</th>
<th>Antarmukha srotas (13Paired)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahirmukha srotas: 9 (+3 in females)</td>
<td>Prana Anna Udaka Rasa Raktu Mamsa Meda Asthi Majja Shukra Mutra Pureesha Sweda</td>
</tr>
</tbody>
</table>

Through ayamamuka of medovaha srotas, nutrients required for medo dhatu alone percolates. The respective srotas permeates only the corresponding dhatu and not other dhatus which is indicative of selective exchange in srotas. The change in the normalcy is facilitated through food and activities causing dosha-dushya sammurchhana resulting in morbidity of srotas. This can either cause an increase or decrease in corresponding dhatu resulting in its abnormal functioning.

### Medo dushti Lakshanā in Ayurvedic classification

<table>
<thead>
<tr>
<th>kshaya</th>
<th>Meda</th>
<th>Meda vridhi</th>
</tr>
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<tbody>
<tr>
<td>Susruta Samhita</td>
<td>Pleehavridhi, sandhishunyata, roukshya, medura-mamsa prarthana</td>
<td>Snigdhāngata, udara-pārsva vridhi, kāśa, svasa, dourgandyam</td>
</tr>
<tr>
<td>Ashtanga Hridaya</td>
<td>Katisvāpa, plehē vridhi, krishāngata</td>
<td>Tadvat (mamsa vridhi like lakshana), Alpa cheshtite sramam, svāsa, sphik-stana-udara lambanam</td>
</tr>
<tr>
<td>Ashtanga Sangraha</td>
<td>Pleehavridhi, Katisvāpa, Sandhishunyata, angarouksyha-kārsya, srama, shosha, medura-mamsa abhilāsha, māmsa kshayokta lakshana</td>
<td>Prameha poorvaroopa, sthoulyopadrava, sleshma mamsa raka vikāra</td>
</tr>
<tr>
<td>Charaka Samhita</td>
<td>Sandhi sphotana, aksh glāni, āyāsa, udara tanutvam</td>
<td>Prameha poorvaroopa, ninditāni</td>
</tr>
<tr>
<td>According to modern</td>
<td>Hyperpituitarism, adrenal gland disorder(increased level of epinephrine and norepinephrine)</td>
<td>Low blood sugar, decreased sensitivity to leptim hormone, disturbance of testosterone is estrogen</td>
</tr>
</tbody>
</table>

Sroto Moola (root) of a respective srotas is considered as the anatomical seat which is also the principal seat of manifestation of a disease. The importance of sroto moola (“Moolamiti Prabhava: Sthanam”) is explained by Acharya Chakrapanidutta using a simile of a tree which is deep rooted. He further explains—“As how a tree, when cut off from its roots is destroyed, so does injury to moola sthana; the whole of the srotas suffers”(Ca.Vi, 5/9). The moola of medovaha srotas is opined as Vrikka commonly in brihattrayi but Vapavahana stated by Charaka Acharya is replaced by kati according to Susrutha Acharya and by mamsa according to Vaghbata Acharya respectively.
Medovaha Sroto moola

Medovaha Srotas (Aacharya Charak)-Vrikka, Vapavahanam, Aacharya Sushrut-Kati, Vrikka.

Both Vrikka and Vapavahana are enumerated in Panchadasha Koshtāṅga by Charaka Acharya. Organogenesis of Vrikka is stated to be from Rakta and meda prasada. Presence of fat in the study of anatomy of kidneys may have been the possible reason of explanation for the organogenesis cited above. The following are the coverings seen: (a) Perirenal fat is a layer of adipose tissue lying outside the fibrous capsule. (b) Renal fascia is the fibro-areolar sheath surrounding the kidney. (c) Pararenal fat lying outside the renal fascia with variable amount of fat, more abundant posteriorly and towards lower pole of the kidney functioning as a cushion for the kidney. Sarangdhara Acharya states that Vrikka aids in the nourishment of abdominal fat. This can be justified from the below pointed facts. (a) Hormones from Adrenal cortex and medulla influence lipid metabolism. (b) Glucocorticoids from Adrenal cortex influences fat metabolism by influencing sterol metabolism and adipose tissue synthesis. (c) Cortisol helps in redistribution of fat in the body.

Vapavahana is explained as ‘udarastha snigdhavartika’ (Ca.Vi. 5/8, Cakrapanidutta Teeka). Modern science explains omentum as large peritoneal folds attached to the stomach that act as storehouse of fat. Absorption of excess fat as intra-abdominal fat i.e. onto the omentum leads to pot-belly (udara lambanam). Thus, vapavahan can be correlated to omentum.

In kati region (waist) there is abundant amount of fat. Waist circumference measurements are evaluated which allows indirect measure of abdominal adiposity. These days, Waist Circumference-Height Ratio (WHtR) is recommended in screening Cardio Metabolic Syndrome. Also, a number of studies on W-Ht Ratio, WC and BMI have proved valuable in predicting hypertension. So Kati may be rightly considered as mulasthana of medovaha srotas.

Muscles, especially the skeletal muscles are known to store fat (IMCL- Intramyocellular Lipids). Impaired medovaha srotas display meda dhatu vridhi or kshaya lakshanā akin to the lakshanā of mamsa vridhi or kshaya. Thus mamsa as medavaha srotomoola can be contemplated.

The reason for vitiation of srotas, in general, is any attribute either similar to that of dosha or opposing to the dhatu. The doshas are vitiated or pacified by agents causing the same due to
the pervasive and diffusive nature of Srotas. When Srotas is in its prākrita nature, the body is not inflicted with diseases but if vitiated causes aggravation of doshas as well as sthāyi or mārgaga dhatu. “Ahitāni tāni dushtāni rogāya vishudhāni sukhāya ca” (A.H, Sa3/ 42.)

Specific causes that account to the vitiation of medovaha srotas include lack of exercise, day sleeping, eating fatty foods, excess intake of alcohol etc. All these have a direct effect on Kapha Pitta vitiation, which in turn, is also responsible in the manifestation of Santarpanotta vyadhi. The pānchabhoutika constitution of medas is Prithvi, Jala and Tejas, which being almost similar to Kapha, maintains Ashraya-Ashrayi bandha with Kapha. This explains as to why any āhāra and / or vihāra which leads to Kapha vridhi causes vitiation of medovaha srotas.

The general symptoms of srotodushti like atipravritti, sanga, vimarga gamana can be explained as the cause for aggravation or dimunition of medo dhatu, enumerates the vridhi and kshaya lakshana of medo dhatu. Susruta Acharya reported symptoms of vitiated medovaha srotas as excessive sweating and unctuousness, dryness of palate, obesity, excess thirst and oedema. He also enumerated granthi, vriddi, galaganda, arbuda, medoja oshtakopa, madhumeha, atisthoulya, atisweda and the like as medo doshaja vikāra.

Few diseases that involve Medovaha srotas in their pathogenesis are enumerated:
(a) Medovaha srotas aggravating factors like atipāna and ati snigdha bhojana is said to cause trsna (āmaja) while oupasargika trsna occurs by the very same factors in a person already afflicted with prameha. (b) Avyāyāma and divāsvapna cause an increase in meda dosa which in excess cause atisthoulya. (c) Accumulation of meda dhatu, obstructing Prāṇa vaha srotas results in Kshudra shvāsa. (d) Swara bheda which is of 6 types, the one caused by excess meda is said to be varjaneeya. (e) Vata when aggravated causes āvarana of meda producing ādyavata.(f) Bahu and abadha meda is explained as a dushya vishesha in prameha nidāna where aggravated Kapha dosha first mixes with meda which is in surplus, non-compact form and similar in properties to kapha. (g) In the context of nidāna of Madhumeha, aggravated meda is said to obstruct the path of vata leading ojas to vasti pradesha, which if ignored in the long run is bound to cause sapta dāruna pidaka. The pidakas are manifested even in apramehi; especially Saravika, kachapika and jālini in persons with prabhoota medas. (h) Medoja vridhi, Chaturtaka jvara, dhatugata jvara, dhatugata kushta, arsas, urustambha are amongst other diseases involving medovaha srotas or medo dhatu.
Etiopathogenesis

The concept of “Vyadhi janaka dosha vyapara” which express the course of the disease from Nidana Sevana to Vyadhi Utpatti. The Samprapti of medasvi purusha has been discussed by Acharya Charaka and Sushruta very well. Acharya Charaka has accepted AHARA as most common pathogenic factor for Medovridhi whereas Sushrutasacharya has accepted AMA DOSHA. In Ashtanga Samgraha more clear Samprapti of medovridhi is explained.

According to Charaka –ch.s.21/5-6

Due to obstruction of Srotas by Meda, the Vata moving mainly intostomach stirs the Agni and absorbs the food. The man digests food speedily and craves for food inordinarily. Over eating produces more Upadanarasa which causes over growth of Meda Dhatu and leads to Sthaulya.

According to Sushrutacharya –sh.su 15/37

According to Sushruta Ama Rasa is produced due to Kaphavardhaka Ahara, Adhyashana, lack of exercise, day sleep. The Madhurabhava Ama Rasa moves within the body, Snigdhansha of this Ama Rasa causes Medovridhi which produces excessive heaviness and flabbiness.

According to Vriddha Vagbhata

Atimadhura, Atisnigdha Ahara, Avyayama, Divaswap, Achinta, Nityapraharsa Sevana

\[ \downarrow \]

Jatharagni Dushti & Kaphavriddh

\[ \downarrow \]

Agnimandhya

\[ \downarrow \]

Formation of Ama Rasa

\[ \downarrow \]

Still continuous Nidana Sevana Leena Sleshma mix with Ama

\[ \downarrow \]

Rasa Dushti and Medo Dhatvagni Mandhya and Medovaha Sroto

\[ \downarrow \]

Dushti
In the manifestation of any diseases vitiation of certain basic components takes place which are described as follows –

- **Dosha**
- **Dushya**
- **Srotas**
- **Agni**

**Dosha**

Even though Sthaulya is a Kapha predominant Vyadhi but involvement of Vata and Pitta cannot be ignored. These three Doshas collectively get involved in this process of etiopathogenesis in Sthaulya.

**Kapha**

Charakacharya has mentioned Sthaulya in Sleshma Nanatmaja Vyadhi. Continuous Nidana Sevana leads to vitiation of Kapha. Most of the symptoms of Sthaulya comes under the category of Kaphavriddhi i.e. laziness, fastigue, heaviness in body, excessive sleep etc. The vitiated Kapha with Ama creates Medovaha Srotosanga which leads to Vimargagamana of Vayu specially Samana and Vyana Vayu.

**Kapha Vridhhi Lakshana**

Agnisad (Mandagini), Prasek (Salivation) Aalasya (Laziness) Gaurium (Heavyness) Swetvarna, Sithilta, Swash (Dyspnoea) and Kasa (Coughing)

**Pitta**

Most of the obese person have Tikshnagni, which is increased due to Pitta. Moreover symptoms like excessive thirst, excessive sweating, body odour etc. have also been mentioned in the Pitta Vridhhi Lakshanas.

**Vata**

Vata creates two conditions in Sthaulya. First is the state of Samana vayu which increases the demand for the food and absorbs the nutrients. Secondly decreased activity of Vyana vayu is responsible for improper circulation and distribution of Dhatu. Due to Sanga in Medovaha Srotas the nutrients cannot be carried by Vyana vayu to their respective Dhatu.

च.15/36[4]
Dushya
In Vyadhi formation Dushya is an important factor. Acharya Sushruta has mentioned Sthaulya as a Dushya dominant disease. In obesity, there is clear visual of excessive production of abnormal Meda Dhatu. Here, Rasa, Mamsa, Meda, Majja and Shukra Dhatu and Sweda are Dushyas as Kapha is seaqted in all these Dhatus on the basis of Ashrayashrayeebhava.

Srotas
Medovaha Srotas is mainly involved in Sthaulya and it gets vitiated due to continuous Sevana of Nidana.

Samprapti clearly states that Rasavaha Srotas is also involved. Excess sweat and body odour indicates the involvement of Swedavaha Srotas. Presence of excess thirst indicates the involvement of Udakavaha Srotas.\(^5\)

Agni
In medasvi purusha, as we know from the Samprapti the Jatharagni becomes Tikshna whereas Medo Dhatvagni Mandhya occurs.

Upadrava
Due to mismanagement and ignorance of the disease, arises the new signs, symptoms or diseases other than the main symptoms of Sthaulya which are known as Upadrava. In modern terminology we can call it as complication of that disease.

Various Acharyas have mentioned Upadrava of Sthaulya.\(^6\)

Sushrutcharya
Apachi, Bhagandara, Jwara, Pramehapidaka, Vata Vikara, Vidradhi.

Ashtanga Samgraha
Bhagandara, Jwara, Prameha, Pramehapidaka, Udara Roga, Urustambha, Vidradhi.

Ashtanga Hridaya
Ama Roga, Apachi, Arsha, Bhagandara, Jwara, Kasa, Kshudha, Mutra Krichchata, Prameha, Sanyasa, Udara Roga,
**Bhavaprakasha**


**Yogaratnakara**


**MODERN REVIEW**

**Fundamental Exploration of Medodhatu Utpatti** (Adipose tissue)

The adipose tissue contains hormones ‘adipokines’ regulating lipid metabolism, weight, inflammation etc. Liver plays an important role in lipid metabolism. It aids in synthesis of VLDL, HDL, TG, cholesterol and also in the synthesis and oxidation of fatty acids. Hormones of Anterior pituitary—GH and ACTH aid in mobilization of fat depot increasing lipolysis and fatty acid metabolism. Insulin is another hormone which aids in the formation of fat from glucose, its deposition in adipose tissue and prevents its breakdown. Thyroid hormones influence all major metabolic pathways by increasing basal energy expenditure through Lipid, protein and carbohydrate metabolism. They affect the synthesis, mobilization and degradation of lipids. The Suprarenals also aid in lipid metabolism via hormones of cortex and medulla.

**Fundamental Exploration of Medoagni** (Thyroxin)

Metabolic syndrome is defined as a conglomerate of conditions like HTN, hyperglycaemia, dyslipidaemia, increased fat around waist which when occurring together increases the risk of heart disease, stroke and diabetes.[17] It occurs in 23% of population and places the person at high risk of developing Heart diseases, diseases of vessels, stroke Diabetes etc.[18] Obesity and metabolic syndrome is seen to influence HPA axis and vice-versa. Hyperaldosteronism is observed along obesity associated hypertension and metabolic syndrome.

Recent studies on metabolic syndrome, Hyperlipidaemia, atherosclerosis of blood vessels; fatty liver, fatty kidneys prove obesity to be a contributory factor. This is exactly explained centuries ago, in Ayurveda classics as the morbidity of *Medovaha srotas* expressed as *Prameha poorvaroopa* and *sthoulya lakshana* with its complications in chronic long standing cases.
CONCLUSION

Medovaha Srotas plays an important role in the transportation of the transforming Meda Dhatu as well as the transudation of nutrients essential for metabolism of Meda Dhatu. When Meda Dhatu is produced in excellence, the individuals are known as MedoSara Purusha. Any kind of vitiation in Medovaha srotas leads to pathogenesis manifested as metabolic disorder in the body. Probing into the main features of morbidity of Medovaha srotas reveals the involvement of hormones responsible for lipid metabolism in abnormal levels. Thus medovaha srotodushti can be correlated to the metabolic syndrome which is a responsible for stholya.

Kapha dhusti(prathavi, aap mahabhut vridhi) → Shatya nirmati → Bahudrav sleshma → Mans, meda dhatu vishesh vikriti(Kled Vikriti) → Amashay, Yakrit(Shatya nirmati) → samskar vikriti → Kledadhikya → Adhogami Kapha → Meda Dushti

The management principles to be adopted in the morbidity of Medovaha srotas is explained as sthoullya chikitsa. In short, the study on medovaha srotas, prevention and management of the diseases as an outcome of its vitiation, thereby becomes important for a healthy living.

Charaka and Sushruta mentioned that kati, vrik and vapavahana are the moolas of medovaha srotas and these are the stores of adipose tissue having important endocrine functions. Medovaha dushti characters mentioned by these Acharayas also may be due to disturbance of equilibrium of hormones. On the basis of above description, it can be concluded that from physiological point of view, all the characters described either by Charaka or Sushruta seem to be changes related to hormonal imbalances.

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