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A COMPREHENSIVE REVIEW OF *MEDOVAHA SROTAS*

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ABSTRACT

The ancient science Ayurveda, describes the anatomy and physiology of the human body vividly in terms of *Dosha, Dhatu, Malas* and *Srotas, Kostha, Kostangas* etc. Human body is considered as a channel system constituted of innumerable channels designed for varied functions. The importance of *Srotas* goes without-a-say from the fact that it has been described by Caraka Acharya in an entire chapter *'Sroto 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 either *Prameha poorva roopa* or *Sthoulya lakshana* or the like. The inter-relation of *medas* and *sthoulya* and the sequelae arising from these have paved way for researches, especially in the treatment aspect recently. This necessitates a thorough knowledge of the basic concepts.

The present study aims at an understanding of *Medovaha srotas,* its *moola sthana* and the diseases that may occur from its vitiation. Similar concepts from contemporary science have been analysed for a better understanding.

Key words: Adipose tissue, Lipids, *Medo dushti*, Metabolic syndrome, Obesity, *Sroto moolam*

INTRODUCTION

Srotas, is as innumerable as the corporeal entities; the latter being neither formed nor destructed without the aid of *srotas*. *"Srotosāmeva samudāyam purushamichhanti".*[1] The quote indicates to the importance as well as the need of *Sroto shāreeram* , especially its clinical aspect.

'Sru gatau' is the root word from which '*srotas*' is derived meaning movement, flow, secreting etc. *Srotas* is defined by Susruta Acharya as those hollow channels, except *Sirā and Dhamani*, which originating from the root spreads in the body and carries specific entities.[2] It is compared to the very fine passages and pores present in the lotus stem, through which *Rasādipoṣhya Dhātu* circulates all over the body and provide nutrition to the body. Thus, *srotas* can be concluded as the entire physiological major and minor channels of the body. *Srototpatti* takes place in intra-uterine life. *Vayu Mahabhuta* with appropriate intervention of *Agni* is responsible for differentiation that aids in the generation of *srotas*. *Srotas* are *Anu* (micro) or *Sthoola* (macro) in size; *vritta*(round), *deergha* (elongated) or *pratāna*(flat) in their shape. Though, they are innumerable in number and so also types, Charaka Acharya and Vagbhata Acharya have classified them to 2 main types- *Bahirmukha srotas* and *Antarmukha srotas.* Sushruta Acharya has described *Yogavahi srotas* as 11 pairs; same as the *Antarmukha srotas* cited by Charaka Acharya but excluding *Asthivaha, Majjavaha* and *Svedavaha srotas* and including *Artavavaha Srotas*

"Yatra sanga kha vaigunyāt vyādhi tatra upajāyate (Su.Su 24/10)." *Srotas* that is vitiated becomes potent to alter the normalcy of *dosas* and vice-versa and this eventually progresses to development of diseases. The channels through which nutrition is transported to *medo dhatu* are termed *medovaha srotas*. It is learnt that any impairment of *medovaha srotas* does affect the other *dhatus*. Most of the *lakshanā* stated in *medo vridhi* or *kshaya* involves other *dhatu vridhi* or *kshaya lakshanā*. The above said is elucidated while describing *Kaphaja prameha* where increased *kapha* vitiates *meda* and together they impair *mootravaha srotas* and *sareera kleda*. *Meda dhatu* has been cited as being transformed to *Asthi* as essence and *swedas* as metabolic waste product; which may mean that these receive nourishment from *meda dhatu* and this can be one of the reasons for not considering their *srotas* separate. This also indicates that any derangement in *medovaha srotas* can cause pathological changes in either of them. Thus,

vitiation of *medovaha srotas* results in a vicious circle involving other *dhatus*, needless to say about the dosas resulting in an array of diseases. Hence the study of *medovaha srotas* becomes clinically significant.

DISCUSSION

2.1.1 *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* (unctousness) 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.

2.1.2 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.

2.2.1 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.

Table1: Types of *Srotas* (CharakaAcharya)

Bahirmukha srotas: 9 *(+3* in females*)*	*Netra(2), Karna(2), Nasa(2), Mukha(1), Guda(1), Medhra(1)* *Yoni(1) and sthana(2)* in females
Antarmukha srotas *(*13Paired*)*	*Prana Anna Udaka Rasa Rakta Mamsa Meda Asthi Majja Shukra Mutra Pureesha Sweda*

2.2.2 Through *ayanamukha* 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.

Table 2*: Medo dushti Lakshanā* in Ayurvedic classics

	Meda kshaya	*Meda vridhi*
Susruta Samhita	*Pleehavridhi, sandhishunyata, roukshya, medura-mamsa prarthana*	*Snigdhāngata, udara-pārsva vridhi, kāsa, svasa, dourgandyam*
Ashtanga Hridaya	*Katisvāpa, pleeha vridhi, krishāngata*	*Tadvat (mamsa vridhi like lakshanas), Alpa cheshtite sramam, svāsa, sphik-stana-udara lambanam*
Ashtanga Sangraha	*Pleehavridhi, Katisvāpa, Sandhishunyata, angaroukshya-kārsya, srama, shosha, medura-mamsa abhilāsha, māmsa kshayokta lakshana*	*Prameha poorvaroopa, sthoulyopadrava, sleshma mamsa rakta vikāra*
Charaka Samhita	*Sandhi sphotana, aksh glāni, āyāsa, udara tanutvam*	*Prameha poorvaroopa, ninditāni*

2.3.1 *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 Susruta Acharya and by *mamsa* according to Vagbhata Acharya respectively.

Table 3- *Sroto Moola* stated by different Acharya

Srotas	*Moola (Charaka&VagbhataAcharya)*	*Moola (SusrutaAcharya)*
Pranavaha	*Hridaya, Mahasrotas*	*Hridaya,Rasavahi Dhamani*
Udakavaha	*Talu, Kloma*	*Talu, Kloma*
Annavaha	*Amashaya, Vama parshva*	*Amashaya,Annavahi Dhamani*
Rasavaha	*Hridaya, Dasha Dhamani*	*Hridaya, Rasavahi Dhamani*
Raktavaha	*Yakrit, Pleeha*	*Yakrit, Pleeha, Raktavahi Dhamani*
Mamsavaha	*Snayu, Twak*	*Snayu, Twak, Raktavahi Dhamani*
Medovaha	***Vrikka, Vapavahanam***	***Kati, Vrikka***
Asthivaha	*Meda, Jaghana*	-
Majjavaha	*Asthi, Sandhi*	-
Shukravaha	*Vrishana, Shepha*	*Sthana, Vrishana*
Mootravaha	*Vasti, Vankshana*	*Vasti, Medra*
Pureeshavaha	*Pakvashaya, Sthoola Gudam*	*Pakvashaya,Gudam*
Swedavaha	*Meda, Romakoopa*	-
Artavavaha	-	*Garbhashaya, Artavavahini dhamani*

2.3.2 Both *Vrikka* and *Vapavahana* are enumerated in *Panchadasha Koshtānga* 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.[10]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.

2.3.3 *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.

2.3.4 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. [11] 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*.

2.3.5 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.

2.4.1 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*.)*

2.4.2 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*.

2.5.1 The general symptoms of *srotodushti* like *atipravritti, sanga, vimarga gamana* can be explained as the cause for aggravation or dimunition of *medo dhatu*. Table 3 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, vriddhi, galaganda, arbuda, medoja oshtakopa, madhumeha, atisthoulya, atisweda* and the like as *medo doshaja vikāra.*

2.5.2 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 *Prāna 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 visesha* 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*.

2.6.1 Lipids may be simple (Fats) or compound (Phospholipids, lipoproteins) or derived (cholesterol). Fats are formed from fatty acids and glycerol and are stored in abundance in the adipose tissue. The white adipose tissue (WAT) is found as visceral and subcutaneous fat while the brown adipose tissue (BAT) is found in neck and thorax of neonates which is later replaced by WAT in adulthood. Fats make 12% body weight, which in excess, is deposited in subcutaneous tissue, mesentry, omentum, intramuscular tissues. Central adiposity is accumulation of fat around the abdomen and is indicative of both subcutaneous and visceral fat. It is seen highly associated with cardiovascular and other metabolic diseases.

2.6.2 Lipid metabolism involves splitting of glycerol and fatty acid, the latter undergoing beta oxidation to form acetyl coA which either enters into citric acid cycle to release energy or converts to acetoacetic acid to be transported to tissues of the body. Acetyl coA acts as a precursor to sterols; 15 molecules of these coA are required to generate Cholesterol which in adrenals and gonads act as precursors to steroid hormones.

2.6.3 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.

2.6.4.1 Alteration in lipid metabolism is clinically presented as Hyperlipidaemia which is an important risk factor in developing atherosclerosis and heart disease. The symptoms of altered lipid metabolism are seen in Obesity, Type1&2 Diabetes, Hypothyroidism, Cushings Syndrome, certain types of renal failures and certain cancers.

Dietary intake of fats (especially saturated) almost accounting to 40% of total calories, intake of cholesterol rich foods, habitual alcohol are other factors said to be responsible to altered lipid metabolism. Epinephrine which has a potent lipolytic action, its impairment is implicated in pathogenesis of obesity. Renin-angiotensin mechanism can lead to HTN and insulin resistance, if activated in adipose tissue. IMCL are valuable energy stores but in absence of exercise along overconsumption of fat is said to be positively correlated to obesity and has detrimental effects on muscular insulin sensitivity.[12]

2.6.4.2 The accumulation of abdominal fat is seen to be associated with cardiometabolic abnormalities. Studies also reveal a positive correlation of central adiposity with gall bladder diseases. Visceral fat accumulation in non-obese with PCOS has been identified as contributing to metabolic disorders like glucose intolerance, hyperinsulinaemia, dyslipidaemia.[13]Studies on Abdominal Fat Index measured by ultrasonography is thought to be a new indicator of visceral fat deposition which may reflect metabolic disorders such as lipid metabolism and glucose metabolism disorders.[14]

2.6.4.3 Research studies on High-Fat/High-Glucose Diet is found to induce a greater weight gain and lower energy expenditure, Mitochondrial dysfunction in Brown Adipose Tissue, Adiponectin Resistance; increase in Lipid Peroxidation and increased FBS- Insulin levels in plasma, increased serum cholesterol, LDL,TG and a low HDL.[15] Researches on obesity seemingly found them to be associated with cancer of gastric cardia, multiple myeloma, breast CA and that cancer mortality increased with metabolic syndrome.[16]

2.7 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.

2.8 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 corelated to the metabolic syndrome which is a recent growing concern. The treatment principles to be adopted in the morbidity of *Medovaha srotas* is explained as sth*oulya 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.

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