



## Review Article

### A REVIEW ON THE ROLE OF AVARANA (OCCLUSION OF BODY CHANNELS) IN METABOLIC SYNDROME

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#### ABSTRACT

In Ayurvedic classics, the diseases caused by *Vatha* are considered as very serious diseases (*Mahagada*). One of the two pathological processes for the vitiation of *Vatha* is *Avarana*. *Avarana* is the disturbed movement of *Vatha* due to obstruction by other factors in the body. In the present social scenario, majority of diseases of *Vatha* are the result of *Avarana*, but the pathogenesis related to *Avarana* is least explored. Metabolic syndrome is one such lifestyle disease comprised of obesity, hyperglycemia, hypertension, hypertriglyceridemia and low HDL level. Majority of the symptoms of different *Avarana* conditions can be identified in patients presenting with metabolic syndrome. The general treatment protocol for *Avarana* is pacification of *Vatha* along with cleansing of channels and treatment of encroaching *Dosha*. Since metabolic syndrome is a disease with *Avarana* as the main pathophysiology, the treatment proposed by *Acharyas* for *Avarana* will be useful in metabolic syndrome. Since the vitiation is predominantly of *Kapha* and *Meda*, the drugs pacifying *Kapha* and *Meda*, cleansing of the channels, strengthening the tissues and not vitiating *Vatha* will be beneficial. The drugs may also be disease specific, like *Pramehahara* and *Medodoshahara*. *Tinospora cordifolia* (*Guduchi*) and *Commiphora mukul* (*Guggulu*) may be effective in metabolic syndrome since they are satisfying the above properties. Serious disease will develop, if the *Avarana* pathology is left untreated as evident in coronary artery disease.

**KEYWORDS:** *Avarana*, Metabolic syndrome, Diabetes Mellitus, *Madhumeha*, *Athisthoulya*, *Medodosh*.

#### INTRODUCTION

The objective of Ayurveda - health and longevity - can be achieved by maintaining the unimpaired movement of the biological dynamic force, *Vatha*<sup>[1]</sup>. According to Ayurveda, the diseases are the result of the vitiation of the *Doshas*<sup>[2]</sup>, of that, the diseases caused by *Vatha* are considered as very serious (*Mahagada*)<sup>[3]</sup>. The pathogenesis of vitiation of *Vatha* is broadly classified into two, *Dhathukshaya* and *Avarana*<sup>[4]</sup>. The *Dhathukshaya* is the diminution of tissue elements (*Dhathus*) and *Avarana* is the disturbance in the movement of *Vatha dosha* by other factors in the body. Due to the excessive use of factors vitiating the anabolic factor (*Kapha*), the transformation factor (*Pitha*), tissue elements (*Dhathu*), waste products (*Mala*) etc, they will get vitiated, obstructing the normal movement of *Vatha*, resulting in *Avarana*. In the present social scenario, owing to prosperity and sedentary lifestyle, the chances of vitiation of *Kapha*, *Pitha*, *Dhathu* (tissue elements), *Mala* (waste products) etc are more and majority of diseases of *Vatha* are the result of *Avarana* rather than diminution of tissue elements. Metabolic Syndrome is a life style disorder attaining epidemic status all over the world. Obesity, Hyperglycemia, Hypertension, Hypertriglyceridemia and low HDL levels are the cardinal symptoms of Metabolic Syndrome. The mortality and morbidity are high due to Metabolic Syndrome, all around the world and there are lacunae in the prevention and treatment of this disease with Allopathic medicine. Ayurvedic diagnosis and treatment protocol can be used for a better management of

this condition by exploring *Avarana*, since *Avarana* can be identified as the pathophysiology of this condition.

#### *Avarana*- Pathophysiology

Chakrapanidatta explains that in *Avarana*, the vitiation of *Vatha* is the result of the obstruction to spontaneous stimulation for movement<sup>[5]</sup>. *Avarana* can also be considered as *Sanga*, as an obstruction, *Samsarga*, the combination of two *Doshas*, and *Vimargagamana* the process of altering the direction of flow. The factor, which obstructs the pathway of *Vatha*, is called as '*Avaraka*' and the *Dosha* (*Vatha* in general or its components) that is entrapped by *Avaraka* is called as *Avritha*. While naming *Avarana*, the name of the *Avaraka* is used as prefix and the name of *Avritha* is used as suffix. For E.g. in *Kapha avritha Vatha*, *Kapha* is the encroaching factor and *Vatha* is the entrapped *Dosha*. On analyzing *Avarana*, we can observe that the encroaching (*Avaraka*) factor will be aggravating first. Since *Avarana* is possible by *Pitha*, *Kapha*, the tissue elements (*Dhathus*), food (*Anna*), waste products (*Mala*), and subdivisions of *Vatha*<sup>[6]</sup>, the etiological factors will be vitiating these factors initiating the pathogenesis (*Shadkriyakala*). Etiological factors explained for vitiation of *Vatha* (*Swanidana*), i.e. food with bitter (*Thiktha*), pungent (*Kadu*) or astringent (*Kashaya*) taste, ununctuous quality (*Rooksha*) etc. will not be causing *Avarana* but *Dhathukshaya*. The different pathological processes for the development of *Avarana* are.

### 1. Avarana, the obstruction

Owing to the excessive use of etiological factors, there will be vitiation of encroaching factors. The vitiated factors will obstruct the channels leading to impairment of the movement of *Vatha*. Once get obstructed, the *Vatha* may simply get lodged there, and may get covered by the obstructing factors. The functions of the encroaching factor will be exaggerated and that of entrapped will be reduced. For e.g. in Hemiplegia (*Pakshaghatha*) especially in the *Kaphaja* type, even though it is a disease of *Vatha*, we can observe the qualities of *Kapha* as coldness, edema and heaviness and a reduction in the functions of *Vatha* as loss of function and loss of sensation since it is in the entrapped state.<sup>[7]</sup>

### 2. Avarana, the interaction

Whenever there is an obstruction in the flow of *Vatha*, it may try to abolish the obstruction. If *Vatha* is not strong enough to nullify the encroaching factor, in the course of time, the encroaching factor and entrapped *Vatha* will get interacted. At this point of time the symptoms will be presented equally by both factors as in *Vatharaktha*. In extremities and joints (*Sakha* and *Sandhi*), *Raktha* and *Vatha* are obstructing the normal flow of each other. They will interact and *Avarana* will happen.<sup>[8]</sup>

### 3. Avarana- the abnormal movement

Because of the obstruction in the pathway of *Vatha*, the direction of flow will get altered and is known as *Vimarga gamana*. The abnormally moving *Vatha* will vitiate other *Doshas*, channels etc. In *Swasa roga Samprapthi* the symptoms produced are of abnormally moving (*Thiryak gatha*) *Vatha* due to obstruction by *Kapha*<sup>[9]</sup>. If *Vatha* is more powerful, it will shatter the obstructing factor and will carry the fragments along its altered pathway. This is happening in *Grandhi visarpa*. When *Kapha* or *Raktha* is obstructing *Vatha*, it will break *Kapha* or *Raktha* and will carry the fragment to skin, veins, tendons and muscle, making tumors.<sup>[10]</sup>

While analyzing the symptomatology of various *Avaranas*, we can observe that some symptoms are of the aggravated factor and some are of the entrapped *Vatha*. Generally the symptoms of encroached factor will be predominant than entrapped *Vatha*. For e.g., in *Kapha Avritha vatha* the symptoms of *Kapha* are, coldness, heaviness, considerable relief by pungent food, inclination towards fasting, exercise, ununctuous and hot ingredients and symptom of *Vatha* is colic pain only<sup>[11]</sup>. In some cases there will be the diminution of function of encroached *Dosha*, contrary to the general principle. For e. g., in *Prana* obstructed by *Udana*, the symptoms presented includes, loss of function of different parts of body, *Ojus* (vital essence), strength, and complexion and even death of the patient<sup>[12]</sup>. Here we can observe diminution of the function of encroached *Dosha*, *Udana*. The pathophysiology happening here is the provocation of the entrapped *Prana* due to obstruction by the encroached *Udana*. It can be concluded that the subtype of *Vatha*, whether it is in encroached or entrapped stage, the more powerful subdivision of *Vatha* will exhibit the aggravation of symptoms. Comparatively less powerful subtype will exhibit a diminution of symptoms. The majority of the

etiological factors described in Ayurvedic classics for the vitiation of different channels are nourishing (*Santharpana*) in character leading to obstruction (*Sanga*) type of *Srothodushti*. Entrapment of *Vatha* will take place during its movement through these channels.

### Diagnostic Considerations

Mainly 42 types of *Avarana* are explained in the *Ayurvedic* classics<sup>[13]</sup>. The complexities of processes of *Avarana* make the diagnosis of *Avarana* very difficult. The factors involved in the pathology can be inferred from the symptoms and the site of manifestation. The learned physician, by keen observation of the symptoms and by utilization of the trial and error method of treatment, can diagnose the variety of *Avarana* precisely.<sup>[14]</sup>

### Treatment Principle

The general treatment protocol for *Avarana* includes pacification of *Vatha* along with cleansing of channels and treatment of encroaching *Dosha*. *Commiphora mukul* (*Guggulu*) and black bitumen (*Shilajith*) along with milk are indicated because they are the best rejuvenating drugs and can normalize the channels and tissues by the cutting (*Chedana*) property. The different treatment modalities of *Avarana* are detailed in Ayurvedic classics.<sup>[15]</sup>

### Complications

If the *Avarana* pathology is not treated properly, heart diseases (*Hridroga*), abscesses (*Vidradhi*), splenomegaly (*Pleehavridhi*), phantom tumor (*Gulma*), reduction of digestive fire (*Agnisadana*) etc will develop<sup>[16]</sup>. In *Hridroga*, the morbid *Doshas* will vitiate the *rasa Dhathu* and changes its quality. If *Kapha* is the vitiating *rasa*, coating (*Lepana*) of the channel happens resulting in obstruction type of vitiation of channels, entrapping the movement of *Vatha*, as evidenced in atherosclerosis of coronary arteries. If this pathology is persisting for more than one year, and if not treated properly, will lead to ischemic heart diseases and finally myocardial infarction.

### Metabolic Syndrome

Metabolic Syndrome is condition where hyperglycemia, hypertension, hypertriglyceridemia, reduced HDL (high density lipoprotein) and increased waist circumference coexist<sup>[17]</sup>. It arises from insulin resistance accompanying abnormal adipose tissue function. It is a risk factor for diabetes mellitus, coronary artery disease, fatty liver etc. Prevention and early intervention of Metabolic Syndrome are very much important in combating Type 2 diabetes and its complications.

The new definition of Metabolic Syndrome by American Heart Association (AHA/NHLBI)<sup>[18, 19]</sup> is

- Elevated waist circumference:
  - Men — greater than 40 inches (102 cm)
  - Women — greater than 35 inches (88 cm)
- Elevated triglycerides: Equal to or greater than 150 mg/dL (1.7 mmol/L)
- Reduced HDL ("good") cholesterol:
  - Men — Less than 40 mg/dL (1.03 mmol/L)
  - Women — Less than 50 mg/dL (1.29 mmol/L)

- Elevated blood pressure: Equal to or greater than 130/85 mm Hg or use of medication for hypertension.
- Elevated fasting glucose: Equal to or greater than 100 mg/dL (5.6 mmol/L) or use of medication for hyperglycemia.

### **Etiology**

#### ▪ **Insulin resistance**

Insulin resistance is the main etiological factor of Metabolic Syndrome. It is a condition where cells fail to respond to insulin hormone.<sup>[20]</sup> Insulin is regulating the delivery of glucose to cells for energy production. In the condition of insulin resistance, glucose, amino acids and fatty acids will not enter into the cells and this result in the increase of blood glucose levels above normal range. <sup>[21]</sup> The liver regulates glucose levels by reducing the secretion of glucose but this is not happening in the patients with insulin resistance.

In fat cells insulin resistance results in reduced uptake of glucose and circulating lipids and increased hydrolysis of stored triglycerides leading to elevated free fatty acid levels in blood plasma. In liver cells it results in reduced glycogen synthesis, storage, failure to suppress glucose production and its release into blood. The increased mobilization of stored lipids in these cells elevates free fatty acids in blood. Elevated free fatty acids in blood, reduced muscle glucose uptake, increased liver glucose production and reduced glycogen synthesis contribute to elevated blood glucose levels. <sup>[22]</sup> At this stage, if more insulin is not secreted by pancreas, blood glucose concentration increases and type 2 diabetes mellitus occurs.

#### ▪ **Increased waist circumference**

Increased waist circumference may be due to an increase in subcutaneous adipose tissue or visceral adipose tissue. Increase in visceral adipose tissue results in release of more adipose tissue derived free fatty acids and are directed to liver. But subcutaneous adipose tissue release lipolysis product into systemic circulation and avoid direct effect on hepatic metabolism. The greater prevalence of metabolic syndrome in Indians is due to relative increase in visceral adipose tissue than the subcutaneous adipose tissue.

#### ▪ **Dyslipidemia**

In insulin resistance, increased flux of free fatty acid to the liver increases triglyceride synthesis and thus hypertriglyceridemia is an excellent marker of insulin resistance. In presence of hypertriglyceridaemia, there is a decrease in the cholesterol content of HDL making the particle small and dense resulting in increased elimination of HDL from the circulation. Thus the reduction of HDL cholesterol in Metabolic Syndrome is a consequence of changes in HDL composition and metabolism.

#### ▪ **Glucose intolerance**

The defect in insulin action leads to reduced glucose uptake and metabolism by muscle and adipose tissue and impaired suppression of glucose production by liver and kidney. For maintaining euglycemia, insulin action and insulin clearance will be modified. Ultimately

this compensatory mechanism fails resulting in diabetes mellitus.

#### ▪ **Hypertension**

Insulin is a vasodilator and is having effect on sodium absorption from kidney. In insulin resistance vasodilator effect will be lost decreasing the blood flow but the renal effect on sodium reabsorption will be maintained leading to increased blood pressure.

#### ▪ **Proinflammatory cytokines**

In metabolic syndrome the increased adipose tissue mass lead to an increase in production of pro-inflammatory cytokines, including interleukin 1, 6 and 18 (IL-1, IL-6, IL-18), resistin, tumor necrosis factor (TNF)  $\alpha$  and C-reactive protein. Macrophages derived from adipose tissue are the primary source of pro-inflammatory cytokines.

#### ▪ **Prothrombotic state**

It is characterized by increased plasma plasminogen activator inhibitor (PAI)-1 and fibrinogen. Fibrinogen, an acute-phase reactant like CRP, rises in response to a high-cytokine state. Thus prothrombotic and proinflammatory states also associate with the metabolic syndrome. <sup>[23]</sup>

### **Clinical Features**

The metabolic syndrome is not associated with defined symptomatology. General findings include increased waist circumference, elevated BP, lipotrophy, *Acanthosis Nigricans*, inability to focus, depression, high blood sugar, increased hunger, intestinal bloating, sleepiness after meals, fat storage, weight gain and difficulty in losing weight.

### **Pathophysiology**

In metabolic syndrome, adverse clinical consequences occur through multiple mechanisms. But the major pathophysiology behind target organ damage is insulin resistance and micro vascular dysfunction. Other factors attributed to organ damage are increased thrombogenesis of circulating blood, endothelial dysfunction, increased arterial stiffness etc.

### **Diagnosis**

The diagnosis of metabolic syndrome is based on physical and laboratory features and may be suspected if the symptoms of any component disorder are present like increased urination, thirst and hunger in diabetes mellitus. Patient reporting a history of diabetes mellitus, hypertension or dyslipidaemia may be screened for metabolic syndrome. Since it is a lifestyle disease, dietary habits, exercise routines etc. are to be enquired. Additional risks such as tobacco use are to be considered for the screening of complications like cardiovascular disease. Family history may be obtained since genetics and environmental factors are playing a major role in the manifestation of the disease. A thorough systemic examination is essential for identifying associated diseases such as cardiovascular disease, Type 2 diabetes mellitus, Polycystic ovary disease, Non alcoholic fatty liver disease, Hyperuricemia, Obstructive sleep apnoea etc.

## Laboratory Investigations

The laboratory investigations to assess metabolic syndrome includes lipid profile, fasting and post prandial blood sugars. Other helpful blood tests may include thyroid function tests, liver function tests, renal function tests and HbA1C. Studies of lipoprotein (a), apolipoprotein B 100, high sensitivity C-reactive protein, homocystine and fractionated LDL-C are to be considered in patients with a history of early coronary artery disease or other atherosclerotic disease. Further laboratory studies should be selected as clinical conditions demands.<sup>[24]</sup>

## Avarana in Metabolic Syndrome

Metabolic syndrome is a major lifestyle disease prevalent all over the world, imparting burden on society in terms of health hazards, expenditure for the treatment and reduction in productivity. Since it is a chronic disease, long term treatment is essential and the complications caused by the disease as well as the treatment with allopathic medicines are increasing the mortality and morbidity of the patient. A better protocol incorporating Ayurveda is necessary for reducing the mortality and morbidity and improving the quality of life of the patients.

The disease conditions described in Ayurveda, which can be correlated with Metabolic Syndrome, are *Athistoulya* (obesity), *Madhumeha* (Diabetes mellitus) *Medodosha* (dyslipidaemia) and *Vathavyadhi* (Hypertension). *Acharyas* emphasized the role of *Avarana* in the pathogenesis (*Samprapthi*) in *Athistoulya* (obesity) and *Madhumeha* (Diabetes mellitus). Even though Hypertension, one of the components of Metabolic Syndrome, is not explained in Ayurvedic classics, its symptoms can be observed in various *Avarana* conditions. Thus it can be concluded that *Avarana* is playing a major role in the manifestation of Metabolic Syndrome. Exploration of *Avarana* pathology in Metabolic Syndrome, in terms of etiology (*Hethu*), symptomatology (*Linga*) and management (*Oushadha*), will bring hopeful results in the management of Metabolic Syndrome. The analysis of the disease can be done by exploring the etiology (*Nidana*), prodromal symptoms (*Poorvaroopa*), signs and symptoms (*Roopa*), trial and error treatment (*Upasaya*) and pathogenesis (*Samprapthi*).

### 1. Etiology (*Nidana*)

In Metabolic syndrome, by scrutinizing the etiology of vitiation of various channels (*Srothas*), we can observe that the causes of vitiation (*Dushti nidanas*) described separately for different channels (*Srothas*) and tissues (*Dhathu*) are overlapping each other. Majority of the etiology (*Nidanas*) are over nourishment (*Santharpana*) in character like excess food (*Athyasana*), heavy food (*Guru anna*), unctuous food (*Snigdha anna*) etc., thereby increasing *Kapha* and other gentle, soft and cool factors (*Saumya bhavas*) and resulting in obstruction (*Sanga*) type of *Srothodushti* and will be the primary cause of *Avarana* of *Vatha*. The etiology of vitiation of *Vatha* in metabolic syndrome will be just opposite to the etiological factors described for the vitiation of *Vatha* in classical texts like food with bitter taste etc., (*Thikthoshanadi swanidanas*). In the present social circumstances due to excess food intake and sedentary life style, the prevalence

of diseases due to over nourishment (*Santharpanajanya rogas*) is more. In metabolic syndrome, as per modern pathology, insulin resistance is the leading cause which is nothing other than the result of increased free fatty acids in the blood due to the over nourishment. It is blocking the entry of glucose into the cell resulting in obstruction (*Sanga*) type of vitiation of *Srothas*. Thus the importance of *Srothodushti* in manifestation of metabolic syndrome can be well established.

The causative factors for the manifestation of *Athisthoulya* and *Prameha* are detailed in the classics. This will be the recent cause (*Sannikrishta nidana*) of metabolic syndrome.

They are Sweet food (*Swadu anna*), Sour food (*Amlanna*), Salty food (*Lavanaanna*), Unctuous food (*Snigdhaanna*), Heavy food (*Guruanna*), Slimy food (*Pischilaanna*), Cold food (*Seethalaanna*), Fresh grains (*Navadhanya*), Beer (*Sura*), Meat of animals of marshy places (*Anoopamamsa*), Sugarcane juice (*Ikshu*), Molasses (*Guda*), Milk (*Gorasa*), Habit of sitting for long time (*Ekastaana asana rathi*), Sleeping without adopting proper procedure (*Vidhivarjitha sayanam*)<sup>[25,26]</sup>. The etiological factors of obesity (*Athisthoulya*) as described by Acharya Charaka are Overeating (*Athisampooranam*), Heavy food (*Guruanna*), Sweet food (*Madhuraanna*), Cold food (*Seethaanna*), Unctuous food (*Snigdhaanna*), Abstinence from sexual intercourse (*Avyavaya*), Lack of exercise (*Avyayama*), Sleeping in day time (*Divaswapna*), Persistent euphoria (*Harshnithyatwa*), Genetic causes (*Beejaswabha*)<sup>[27]</sup>.

In channels (*Srothas*) also, *Medo vaha srothas* should be given prime importance because the basic pathology is occurring in this *Srothas*. The remote causes (*Viprakrishta nidanas*) are setting the background for the manifestation of the diseases. The lack of exercise (*Avyayama*), sleeping during day time (*Divaswapna*), heavy food (*Medyanam athibhakshanam*) and alcoholism (*Varuni sevana*) are the etiological factor for the *Medovaha srothodushti*<sup>[28]</sup>. It can be considered as the stage setter of metabolic syndrome.

Insulin resistance can be included under the heading of the definite cause (*Pradhanika hethu*) because it is resulting in the disease definitely.

### 2. Prodromal Symptoms (*Poorvaroopa*)

Some of the prodromal symptoms of *Prameha* described in Ashtanga hridaya can be identified in early stages of metabolic syndrome like desire for the comfort of bed, seat and sleep (*Sayyasugham, Asana sugham, Swapna sugham*), coating of heart, eyes, tongue and ears (*Hritnethrajihwa sravana upadeham*), stoutness of body (*Ghanangatha*), excess growth of hairs and nails (*Kesana nagma athivridhi*), desire for cold (*Seethapriyatvam*) etc<sup>[29]</sup>. The symptoms of insulin resistance can be considered as the prodromal symptoms of metabolic syndrome. It includes brain foggy and inability to focus, intestinal bloating, sleepiness especially after meals, weight gain, fat storage, difficulty losing weight, depression and increased hunger.

### 3. Symptomatology (Roopa)

The cardinal symptom of *Prameha*, i.e., excess and turbid urine (*Prabhootha avila moothratha*)<sup>[30]</sup> and that of *Athisthoulya* i.e., pendulous buttocks, abdomen and breasts (*Chala sphig udara sthana*) and disproportionate strength with physical growth (*Ayadhopachaya uthsaha*)<sup>[31]</sup> can be identified in Metabolic syndrome. Since *Avarana* is the pathophysiology behind the manifestation of Metabolic syndrome, symptoms exhibited in various *Avarana* conditions can be identified in patients with Metabolic syndrome. 211 symptoms are described in various *Avarana* conditions and patients with Metabolic syndrome are exhibiting majority of these symptoms. In clinical practice, increased waist circumference, elevated blood pressure, lipotrophy and *Acanthosis nigricans* may be found during physical examination alerting physician to search for biochemical abnormalities.

### 4. Trial and Error Treatment (Upasaya)

Since types of *Avarana* are innumerable, *Acharyas* emphasizes the onset of symptoms and the application of trial and error method of treatment (*Upasaya*) for identifying the underlying factors<sup>[32]</sup>. In metabolic syndrome also, a treatment protocol based on *Avarana* pathology has to be formulated on the basis of symptomatology and the pathogenesis can be tested by the use of trial and error method of treatment (*Upasaya*).

### 5. Pathophysiology (Samprapthi)

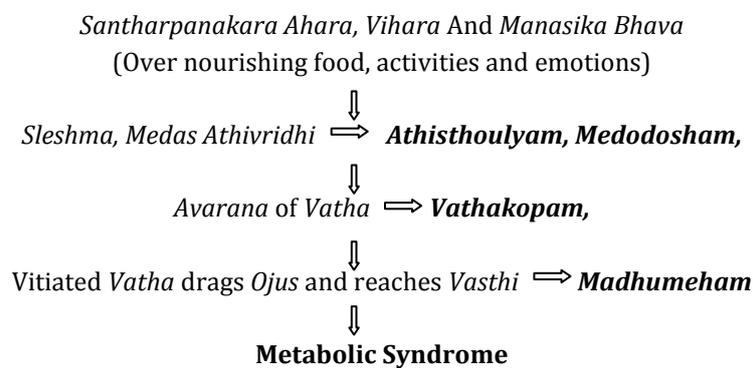
#### Pathophysiological factors (Samprapthi Ghatakas) of Metabolic syndrome

*Samprapthi Ghataka* chiefly constitutes *Dosha*, *Dooshya*, *Srothas*, *Ama* and *Agni*.

**1. Dosha :** *Kapha* and *Vatha* are the main *Dosha* involved in metabolic syndrome. *Kapha* is responsible for *Margavarana* of *Vatha* leading to *Vathakopa*.

**2. Dooshya :** In metabolic syndrome, the main *Dooshya* involved is *Medodhathu* and subsequently other *Dhathu*

#### The process of Samprapthi



#### Treatment

Treatment (*Chikitsa*) is nothing other than the breakage of pathophysiology (*Samprapthi*). Since metabolic syndrome is a disease with *Avarana* as the main pathophysiology, the treatment proposed by *Acharyas* for *Avarana* will be useful in metabolic syndrome. Since the vitiation is predominantly of *Kapha* and *Meda*, the drugs pacifying *Kapha* and *Meda*, cleansing the channels, strengthening the tissues and pacifying *Vatha* will be beneficial<sup>[33]</sup>. The drugs may also be disease specific, like *Pramehahara* and *Medodoshahara*.

will get vitiated. The involvement of other factors like *Rasa*, *Raktha*, *Mamsa*, *Majja*, *Sukra*, *Ojus*, *Vasa*, *Lasika*, *Udaka* etc. are responsible for the different clinical presentation of metabolic syndrome.

**3. Srothas:** In metabolic syndrome mainly involved *Srothas* is *Medovaha srothas*. The effect of *Srothodushti* will be reflected in other channels (*Srothas*) leading to different diseases as Type 2 diabetes mellitus, cardiovascular disease etc. *Athipravriti*, *Sanga*, *Sira grandhi* and *Vimarga gamana* are the four types of *Srothodushti*. All these types of *Srothodushti* are observed in metabolic syndrome.

**4. Agni:** All diseases occur due to vitiation of *Agni*. In metabolic syndrome, digestive fire in stomach (*Jataragni*) and digestive fire in tissues (*Dhatwagni*) are important. Because of obstruction of pathway of *Vatha* by *Medas* (*Medasavritamarga*) *Vatha* will be directed to the major channel (*Koshta*), increase digestive fire (*Jataragni*) and the person will consume more and more food and will become more obese. This result in release of more free fatty acids, and increased FFAs vitiates the digestive fire in tissues (*Dhatwagni*). Due to *Dhatwagni dushti* the metabolism of *Medas* will be deranged leading to accumulation of free fatty acids (*Snigdhasma*) in the circulation, which in due course leads to development of insulin resistance. This *Avarana* condition if not treated properly and lasts for more than one year leads to *Agnisadana* (may be correlated with the reduction in insulin production and its effectiveness on cells) which is one of the complication of *Avarana* and finally results in diabetes mellitus.

**5. Ama:** The accumulation of free fatty acids in the circulation can be considered as *Ama* in the case of metabolic syndrome. It hampers *Dhatwagni* leading to further worsening of insulin resistance which is the key pathology in the metabolic syndrome.

*Tinospora cordifolia* (*Guduchi*) and *Commiphora mukul* (*Guggulu*) may be effective in metabolic syndrome since they are satisfying the above properties. *Tinospora cordifolia* (*Guduchi*) is *Tridoshasamaka*, *Samgrahi*, *Balya*, *Dipana*, *Rasayana*, *Raktasodhana* and is useful in *Kushta*, *Vatarakta*, *Jvara*, *Kamala*, *Pandu* and *Prameha*. *Commiphora mukul* (*Guggulu*) is pacifying *Vatha* and *Kapha* (*Vatavalasajith*), It is useful in *Amavatha*, *Grandhi*, *Sopha*, *Gandamala*, *Medoroga*, *Prameha*, *Kushta*.<sup>[34]</sup>

These two drugs may be beneficial in metabolic syndrome since they are effective in relieving the *Avarana*

pathology. On analyzing the properties they are pacifying all the three *Doshas*, cleansing the *Srothases*, pacify the *Medodosh* and are disease specific like *Pramehahara*<sup>(35)</sup> and *Medodoshahara*<sup>(36)</sup>. Moreover they are *Balya* and *Rasayana* in properties.

### CONCLUSION

Since metabolic syndrome is attaining epidemic status all over the world, it is high time to establish the measures to prevent manage and palliate the disease. Ayurveda is having the potential in controlling this lifestyle disease without resulting in other complications. The established treatment modalities for metabolic syndrome in Ayurveda are not sufficient to meet the threat of this epidemic disease. A reassessment of Metabolic Syndrome on the basis of *Avarana* will show a better method in the prevention of metabolic syndrome, management of the disorder and its complications. Thus Ayurveda can improve the health and increase longevity of patients with Metabolic Syndrome.

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