



Review Article

PARALLEL STUDY OF *MEDODHARA KALA* AND ABDOMINAL ADIPOSE TISSUE WITH SPECIAL REFERENCE TO *STHOULYA* (OBESITY)

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ABSTRACT

Obesity which is neuroendocrine disorder seems to be common predisposing factor for almost all non-communicable diseases. This neuroendocrine disturbance causes multiple systemic disorders and finally *Ayurhasa* (reduction in longevity of life) by various means. Ayurveda mentioned eight pathophysiological conditions considered as *Nindya* (worse conditions). *Atisthool* (excessive weight) is one of these conditions due to improper *Aahara* (dietary habits), *Vihar* (sedentary life style) and changed sleep pattern. *Apachita meda* (improperly metabolized fat) deposited in *Udara* (abdomen). *Medodharakala* according to Ayurveda and abdominal linings bear several similar characteristics related to fat and *Medodhatu* deposition. Deterioration of functioning of *Medodhara kala* leads to deposition of *Apachita meda* leading to *Sthoulya*. In obesity, abdominal wall, space between organs stores much amount of adipose tissue (site of *Meda* deposition). So this article reveals with parallel study of *Medodhara kala* and abdominal adipose tissue to find out similarity.

INTRODUCTION

Ayurveda is the science of life explains all concepts to obtain healthy life along with maintenance of health^[1]. Individual having ideal characteristics with proper measurements of various parts of body nomenclacted as *Prashastha Purusha* (healthy individual). Variation from the characteristics is *Aprashsta* i.e., *Nindya* (unhealthy)^[2]. *Atisthool* (with excessive weight) is one among them which further causes multiple systemic disorders and finally affect longevity of life. According to Acharya Charaka, *Medo dhatu vridhhi* is etiological factor for *Sthoulya*^[3]. *Dhatu* are seven functional elements of the body functioning in various ways for maintenance of homeostasis. *Medodhatu* (adipose tissue/fat) when synthesized in excessive amount and not get properly metabolized (*Apachita meda*) deposited in *Udara pradesha* (abdomen) leading to *Sthoulya*. Also *Udara* (abdomen) is site of *Medodhara kala*^[4].

As *Kala* is the structure limiting *Dhatu* and *Ashaya*, *Medodhara kala* is membranous structure located between *Medodhatu* and *Ashaya*. *Sthoulya* is included in *Medovikara* and also in *Santarpanoththa vikara* condition (due to over nutrition)^[5]. Pathogenesis involves deranged metabolism of *Meda* leading to sustain *Apachita meda* which restrict formation of other *Dhatu* build up causing other systemic disorders.

According to modern science, obesity is accumulation of excessive fat that promotes risks to health. Obesity is defined by BMI, BMI exceeds over 25 is overweight and over 30 is obese. Adipose tissue is a fat storage tissue which forms membrane or layers. Total abdominal fat is distributed in various depots, subcutaneous, visceral between viscera of abdomen^[6].

As per Ayurveda, *Medodhara kala* is membrane like structure involved in *Sthoulya*. This *Kala* can be compared with visceral fat depot.

DISCUSSION

Dhatu are bodily tissues functioning for maintenance for internal environment. Amongst which '*Meda*' (fat) is oleaginous functional element (tissue) in the body^[7] for maintenance of smoothness, generation of energy, protection. *Vapa* (abdominal covering) and *Vasa* (oily substance within muscle) are other similar

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structure like *Meda* according to Ayurveda. *Meda* related *Srotas* (system) is *Medovaha srotas* having its root as *Vrukka* (kidney) and *Vapavahan* (abdominal covering)^[8]. Acharya Sushruta mentioned sites where *Meda* (body fat) is deposited as^[9]

- *Anvasthi* and *Sthulasthi abhyantara sthana* (within the cavity of small and large bones)
- *Sarakta meda* (bone marrow)
- *Udara* (abdomen)
- *Shir kapal Abhyantara* (flat bones of skull)

As per modern science, essential fat in body is necessary to maintain life and various functions whereas excess fat get deposited in adipocytes in adipose tissue called storage fat. *Meda dhatu* is been classified in two categories; *Poshya* and *Poshaka*. One can assume essential fat as *Poshaka medodhatu* and storage fat as *Poshya medodhatu*.

Kala is histologically defined by Acharyas as membrane like structure or layer limiting *Dhatu* (content) and *Ashaya* (storage cavity)^[10]. Related to *Medodhatu*, *Medodharakala* is residing site of *Meda*. *Medodharakala* is primarily situated in *Udara* (abdomen). *Anvasthi* (bones). *Mastulunga* (nervous tissue) is also deposition site of *Meda* in *Kala*^[11]. Tissue containing fat is adipose tissue which is form of connecting tissue. Adipocytes in tissue are energy restoring cells extend throughout body. Subcutaneous area, visceral area, inner cavities are major depots of fat. Based on tissue colour and function, adipose tissue is classified into white adipose tissue and brown adipose tissue. Most of bodily fat is white fat stores extra energy, excess of which leads to obesity.

Adipocytes are categorized into 3 different cell types based on origin location and function

- White
- Brown
- Beige Adipocytes

White adipocytes are most abundant, filled with single lipid with few organells. Brown adipocytes are very metabolically active. Beige are scattered in white having potential to generate heat.

Fat depots are subcutaneous, intramuscular and visceral^[12].

Adipose Tissue Depots

Subcutaneous fat: Under skin, 90% of total fat is subcutaneous. Mainly around hips, thighs, belly. Lipton secreted out by this fat help to regulate appetite and metabolism. Adiponectin act as anti-inflammatory hormone modulate blood sugar level.

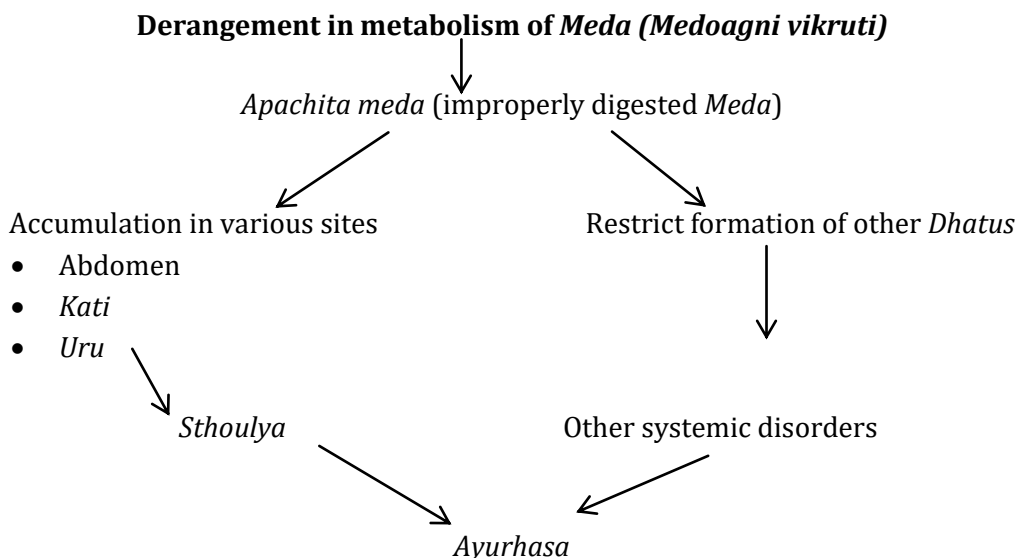
Visceral fat: 10% of total fat is visceral fat inside abdominal cavity and around organs.

Abdominal fat depots: Visceral- Omentum, epiploic appendices, extraperitoneal, retroperitoneal.

Omentum is apron of tissue covers abdominal organ. Also referred as belly fat, visceral fat. It is considered as sheet of unhealthy fat. Along with immunological and regeneration function, act as store house of adipose tissue. It extends from greater curvature of stomach float on surface of intraperitoneal organ (intestine). It is double sheet of peritoneum having surface area 300cm²-1500cm². Omental contents are adipose cells in abundant number, fibroblast, pericytes, leucocytes and omental glomeruli. Though it is membrane like, but functions as organ. Subcutaneous fat is deeper layer of skin supposed to be not much harmful. Though not visible, visceral fat is harmful and may be associated with diseases or prone to diseased condition^[13].

Fat filled out patches with vascularity located on wall of colon are epiploic appendices^[14]. Act as cushion. The connective tissue between fascia and peritoneum is extraperitoneal fat. On anterior wall of abdomen, fat is scanty but on posterior wall. It is abundant around kidney.

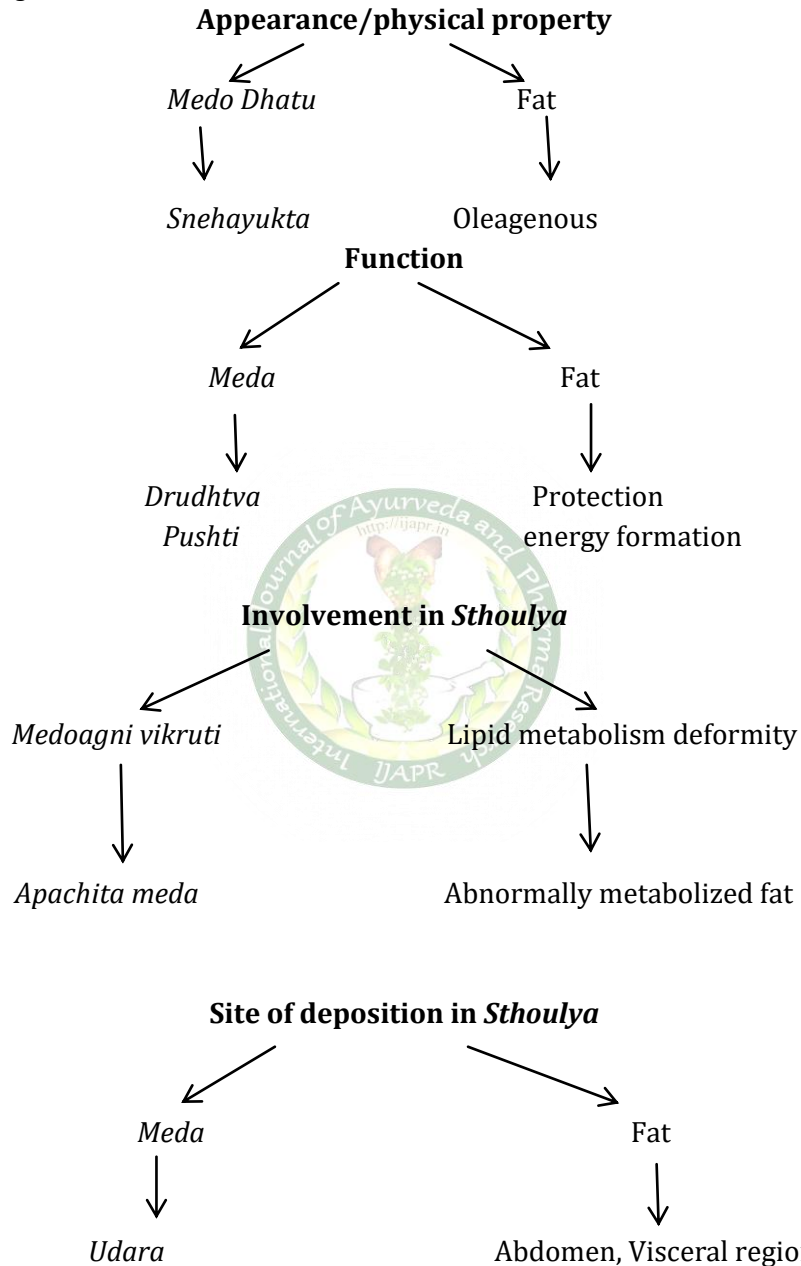
Sthoulya (obesity), *Medodhatu* and confirmation of structure confined to *Medodhara kala*:



Acharya Charaka and Susruta mentioned bodily measurements to define normalcy of constitution (physic). On the basis of constitution, Acharya Susruta defined eight conditions as *Asthanindita* (eight diseased conditions). One of which is *Atisthool* (overweight and obese), which is pathological condition^[15]. '*Upachita sharir*' (excessive nourished) leading to overweight^[16]. Here abnormal *Upachaya* of *Medodhatu* occurs. *Atisthool* is *Medodushtijanya* (due to vitiation of *Meda*) *Medoroga*. One of the chief sites for

deposition of *Meda* is *Udara* (abdomen). Also being the site of *Medodharakala*, *Kala* is considered as store of fat.

Meda (fat) is wisely spread all over body subcutaneously but *Medodharakala* related to *Sthoulya* positioned in *Udarapradesha* in the form of *Vapavahan*.^[17] Abdominal region have multiple sites of fat storage but one can assume *Medodharakala* as membranous omentum.



CONCLUSION

Fat is deposited subcutaneously and in visceral region in body considered as fat depots. *Medodhatu* is distributed all over body specifically in *Medodharakala* residing within abdomen, bone, bone marrow, nervous tissue. Concerned to *Sthoulya*, fat storing *Medodharakala* is comparable with visceral fat depots. As abdominal region consist of numerous visceral fat depots. *Udarasastha medodharakala* residing in *Vapavahana* being histologically membranous in

nature, predominantly comparable with visceral abdominal omentum. Abdominal omentum can be anatomically considered as *Medodhara kala* in *Sthoulya*.

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