

FUNCTIONAL ANATOMY OF RAKTAVAHA SROTAS IN VATARAKTA W.S.R. TO GOUT

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ABSTRACT

Raktavaha srotas are the channels which circulates the *Rakta dhatu* to each and every part of the body for the nourishment of every tissue. It originates from *yakrit* (liver), *pleeha* (spleen) and *raktavahini dhamini* (blood vessels). According to *Ayurveda*, *Vatarakta* includes vitiation of *vata dosha* and *Rakta dhatu*. The pathway of *vata dosha* is obstructed by vitiated *rakta dhatu*. Due to this obstruction, *vata dosha* abnormally increases by all its qualities to produce the disease particularly at smaller joints such as joints of fingers (metatarsal & metacarpal joints) because they have closely related blood vessels which are curved as per shape of the joint. This anatomical condition helps for saturation of increased *dosha* as well as *dushya* at that place to create *Vatarakta*. As per Modern medicine, Gout is a disorder of purine metabolism

manifested by increased serum uric acid concentration. It involves periarticular tissues to the presence of monosodium urate crystal. That monosodium urate crystal preferentially deposits in peripheral connective tissue in and around synovial joint, initially favouring lower limb rather than upper limb and especially targeting the 1st metatarsophalangeal joint and small joints of feet and hands. On the basis of similarity in functional anatomy of *Vatarakta* can be correlated with Gout. Further anatomical aspect of *Vatarakta* will be described in full paper.

KEYWORDS: *Raktavaha Srotas*, *Raktadhatu*, *Vatarakta*, Gout.

INTRODUCTION

The word “*Srotas*” is derived from Sanskrit root “*Sru Sravane*” which means oozing and flowing properly and term “*Sravanat Srotasmsi*” defined as the structure where flow is regulated by oozing or filtration phenomenon.^[1] Structurally, these are the hollow channels originating from the root space, spread in the whole body to act as a transport system for the fulfilment of nutritional needs of organisms and to get rid of the end results of metabolism from their body. If *Srotas* are in healthy state the formation of *Dosha*, *Dhatu* and *Mala* are good, when *Srotas* are vitiated then *Dosha*, *Dhatu* and *Mala* also become vitiated and body becomes diseased. *Raktavaha Srotas* are the channels which circulates the *Rakta dhatu* to each and every part of the body for the nourishment of every tissue. Due to aggravation of *Vata dosha* and further vitiation of *Rakta dhatu*, *Raktavaha Srotodushti* occurs in *Vatarakta* and circulation of *Rakta dhatu* get hampered. As per modern medicine, Gout is a disorder of purine metabolism manifested by increased Serum Uric Acid concentration. On the basis of similarity in functional anatomy of *Vatarakta* can be correlated with Gout.

MATERIAL AND METHODS

Rakta Dhatu

According to *Ayurvedic* literature, when *Rasa* is mixed with *Ranjak Pitta* it forms *Rakta dhatu*. *Rakta Dhatu* has a special relationship with the liver and spleen. *Acharya Sushruta* has clearly mentioned *Yakrit* as only the site where production of *Rakta dhatu* takes place after being processed by *Raktagni* and *Ranjak pitta*.^[2] *Ayurveda* believes that *Rasa dhatu* formed by *Ahar Rasa* gets converted in *Rakta dhatu* with the help of *Rasa Ranjan* into *Yakrit* and from there *Rakta dhatu* is distributed and circulated through *Raktavaha Srotas*. As regards, the formation of *Rakta dhatu* & its distribution, the *Ayurveda* takes into account a group of organs involved in the process of genesis directly or indirectly. From these organs, the *Rakta dhatu*, after getting originated follow certain tracts or roots to reach in the channels of greater circulation. Thus, the channels carrying the *Rakta dhatu* from its sites of origin to the pumping place of greater circulation and from there to each and every part of the body appear to come under the *Raktavaha Srotas*.

Moolasthanana of Raktavaha Srotas

The site of origin of *Srotas* is considered as *Srotomoola*. *Acharya Charak* has mentioned *Yakrit* (liver) and *pleeha* (spleen) as *moolasthanana* of *Raktavaha Srotas*^[3] whereas *Acharya*

Sushruta has mentioned *Yakrit* (liver), *Pleeha* (spleen) and *Raktavahini dhamini* (blood vessels) as *Raktavaha srotomool*.^[4]

Raktavaha Srotas Dusti Hetu

Raktavaha Srotas get vitiated due to intake of *Vidahianna pana* (food & drinks which cause burning sensation), *Snigdha* (oily), *Ushna* (hot) *drava* food consummation along with exposure to *srotodushti*.^[5]

Raktavaha Sroto Vidha Lakshan

When *Raktavaha Srotas* are injured, blue coloration of the body, fever, burning sensation, anemia, hemorrhage and redness of the eyes manifest.^[6]

Structural Anatomy of *Raktavaha Srotomula*

Yakrit (liver)

According to *Acharya Sushrutha* *Yakrit* (liver) is originated from *Shonita (Rakta)*.^[7] Liver is a large, solid, gland situated in the right upper quadrant of the abdominal cavity. The liver occupies whole of the right hypochondrium, the greater part of the epigastrium and extend into the left hypochondrium.^[8] It is made up of many lobes called hepatic lobes. Each lobe consists of many lobules called hepatic lobules (structural and functional unit of liver). The lobule is honey comb like structure and it is made up of liver cells called hepatocytes. These cells are arranged in different plates. Each plate is one cell thick with a central vein. In b/w the cells are bile canaliculi. Each lobule is surrounded by portal vein and a tributary of bile duct. In b/m the plates, the sinusoids or blood spaces are present. The sinusoids receive blood from a branch of portal vein and a branch of hepatic artery of the portal triad. Sinusoids opens into the central vein. Central vein empties into hepatic vein. Liver receives blood from two sources namely, the hepatic artery and portal vein. Metabolism of carbohydrates, proteins, lipids and vitamins and many hormones is carried out in liver. Purine metabolism take place in the liver.^[9] Liver is a *Raktavaha Sroto mool* and due to disturbance in its anatomy or metabolic function as purine metabolism, appearance of gout takes place in the small joints of feet and hands specially targeting the first meta tarso phalangeal joint.

Pleeha (Spleen)

According to *Acharya Sushrutha* *Pleeha* (spleen) is also originated from *Shonita (Rakta)*.^[10] *Pleeha* is a big storage of *Rakta dhatu*. The spleen is a wedge shaped lymphatic organ lying mainly in the left hypochondrium and partly in the epigastrium. It acts as a filter for blood

and plays an important role in the immune responses of the body.^[11] The spleen is part to the circulatory system as lymph nodes are to the lymphatic system. It is a major repository mononuclear phagocytic in the red pulp and lymphoid cells in the white pulp.

***Raktavahi dhamni* (Blood vessels)**

Raktavahi dhamni conduct rakta all over the body. It can be correlate with the blood vessels which also conduct the blood all over body.

PATHOGENESIS

Vatarakta

This disease develops with morbid combination of dietetic and behavioral causes e.g. improper food habit which produces morbid increase in *Vata dosha*, and further *Vata dosha* vitiates *Rakta dhatu*. It also creates weakness to *Rakta dhatu*. Further, cause like long and persistent and uncomfortable travel via camel, elephant or horses etc. (in present era long drive on a motor bike or daily journey in an uncomfortable or crowded vehicle) enhances accumulation of already exacerbated *Vata-Rakta* union. The pathway of *Vata dosha* is obstructed by *Rakta dhatu*. Due to this obstruction, *Vata dosha* abnormally increases by all its qualities to produce the disease particularly at smaller joint called as *Vatarakta*.^[12] *Vatarakta* has two types, *Uttan* and *Gambhir*. In *Uttan* condition, disease located in *Twak* (skin) and *Mamsa* and in *Gambhir*, disease located in *Rakta*, *Mamsa*, *Meda* etc. which is a severe type presentation of *Vatarakta*.^[13]

Gout

Gout is a metabolic disorder of purine metabolism clinically characterized by recurrent attack of acute arthritis progressing to chronic deforming arthropathy, formation of tophi and development of systemic complications like renal failure. Gout causes elevation of uric acid levels in blood and leads to deposition of urate crystals in tissues. Hyperuricemia is the cardinal abnormality leading to gout. Uric acid metabolism follows different pathways. Uric acid is the end product of purine metabolism. Purines are derived partly from the diet and partly from endogenous metabolism. In the liver nucleic acid and purine nucleotides are degraded to form the purine bases xanthine and hypoxanthine. These are oxidized to form uric acid by the enzyme xanthine oxidase. The urates circulate in the plasma to be excreted mainly by the kidneys. A smaller amount is secreted into the gut.

Hyperuricemia is the central abnormality in gout but this may not lead to gout in all cases. Arthritis caused by the deposition of monosodium urate crystals in the synovium. Polymorphonuclear leucocytes ingest the crystals. They release lysosomal enzymes which cause inflammation. Kinin and related cytokinin lead to increased vascular permeability. Crystals are demonstrable in the synovium and articular cartilage in the stage of acute arthritis. In the chronic stages, erosion of articular cartilage, proliferation of synovial membrane, pannus formation, cystic erosion of bones and secondary osteoarthritic changes develop. Tophi are nodular urate deposits found in and around the joints and in the articular cartilage. Histologically these consist of monosodium urate crystals surrounded by mononuclear cell infiltration and foreign-body giant cells. These lead to osteoarthritic changes, ankylosis of joints and tissues destruction.^[14]

Anatomical Changes in Vatarakta and Gout

According to *Ayurveda*, the sites where *Vatarakta* is manifested are hands, feet, fingers including toes and all the joints. In the beginning, the hands and feet are afflicted from this base, it spread to all the other parts of the body because of the subtle pervasive nature of *Vata & Rakta*. Because of their fluidity & mobility, they (*vata & rakta*), while moving through the vessels, get obstructed in the joints which makes them further aggravated. Because of the tortuous nature of the course in the joints, the morbid matter gets lodged there. Being localized in the joints, they get further associated with *pitta*, etc. (i.e. *Kapha & Vata* aggravated because of other etiological factors) and produce different types of pain characterized by the nature of these elements. Small joints such as joints of fingers have closely related blood vessels which are curved as shape of the joints. This condition helps for saturation of increased *dosha* as well as *dushya* at that place. The disease starts mainly with smaller joints like joints of fingers (metacarpal and metatarsals joints) and spreads in the bigger joint at the time passes and ultimately becomes chronic. The disease commonly observed to be started always with the thumb of the foot. Therefore, in general, the disease gives rise to pain in all these joints.^[15,16]

As per modern medicine, In Gout, involves periarticular tissues to the presence of monosodium urate crystal. That monosodium urate crystal preferentially deposits in peripheral connective tissue in and around synovial joint, initially favoring lower limb rather than upper limb and especially targeting the 1st metatarsophalangeal joint and small joints of feet and hands.^[17] In acute condition, classically intensely painful monoarticular arthritis of

the metatarsophalangeal joint of the big toe develops within minutes to hours. The joint is red and swollen and this may be mistaken for septic arthritis. The term podagra denotes painful affection of the foot occurring as a result of metatarsophalangeal arthritis. Later other joints are involved. In chronic condition, the acute attacks do not remit completely and the joints become constantly painful and swollen. Tophi develop as subcutaneous nodular masses around the joints and on tendons. They are soft and small initially but later on become hard and may reach up to 7cm in diameter.^[18]

CONCLUSION

Srotas is a unique doctrine of *Ayurveda*, explaining the circulation and transportation of *Poshak dhatu* to *Phosya dhatu*. Vitiating of these structures produces diseases in the body reflected by the *moolas* of particular *Srotas*, thus the structural and functional integrity of these transporting systems is of great significance for attaining healthy state that's why some authorities consider that the human body is conglomeration of the *Srotas*. "*Moolamiti pabhabhavsthanam*" means the functioning of *Raktavaha Srotas* completely depends upon state of *moolsthana*. So, it can be concluded that liver is the *Moolsthana of Raktavaha Srotas* and it is responsible for Purine metabolism. After rectification of Purine Metabolism Gout can be treated. *Acharya Sushruta* has clearly mentioned, *Yakrit* (liver) as the site where production of *Rakta dhatu* takes place. To prevent Vitiating of *Rakta dhatu*, the disease *Vatarakta*, pertaining to that specific *Raktavaha Srotas* can be prevented. On the basis of similarity in functional anatomy of *Vatarakta* can be correlated with Gout. As per *Ayurvedic* literature and modern medicine both, usually starts from the big toe and gradually involves other joints or tissues. *Moola* of *Raktavaha Srotas* as liver and spleen denotes structure responsible for the monitoring of status of *Srotas*.

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