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Critical understanding of *Rajayakshma Samprapti* with special reference to Respiratory Dominant Pulmonary Tuberculosis

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ABSTRACT

Rajyakshma is one among the Asthamahagada explained by Acharya Charaka and termed as king of the disease. It had always been challenge to diagnose and treat due to its syndromic manifestation and also the multisystem involvement. So before planning the treatment it is very necessary to understand the Nidana and Samprapti in detail. Rajayakshma has been correlated to many Immunodeficiency Syndromes but on critical analysis on symptomatology, it clinically resembles a respiratory dominant multisystem disease. The condition was also identified as an Aupsargika Vyadhi and also a set of predisposing factors i.e., Chaturvidha Nidana. Due to the indulgence in Nidana there is viatiation of Tridoshas and Sapta Dhatu. In modern era Rajyakshma which affecting the Pranavaha Srotas can be correlated to pulmonary tuberculosis. Though there is difference in the pathogenesis of Rajayakshma and pulmonary tuberculosis the clinical picture of both is quite similar. The western medicine deals more with the infective focus, it method of spread and different modalities of diagnosis and standard WHO Antimicrobial agents. Aims and objectives of the paper to express the basic concept of Hetu and Samprapti of Rajayakshma which affecting the Prana Vaha Srotas w.s.r to pulmonary tuberculosis to its full perspective.

Key words: Rajayakshma, Nidana, Samprapti, Pulmonary TB

INTRODUCTION

Rajayaksma is a group of disease gets manifested with the vitiation of *Tridosha* and *Saptadhatu*. The group of symptoms is *Vyadhi* a group of *Vyadhi is Yakshma* and king among the *Yakshma* is *Rajyakshma* which means

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Published by Maharshi Charaka Ayurveda Organization, Vijayapur, Karnataka (Regd) under the license CC-by-NC-SA of fraying condition huge magnitude. Where Anulomana and Pratilomana are in types of etiopathogenesis. Rajayakshma^[3] is studied in detail in ancient India since the Vedic period and tuberculosis is the nearest clinical entity for Rajyakshma. The maximum impact of Rajyakshma in India is on respiratory system and meninges however every structure is affected by it but the present study is more focus on respiratory presentation of Rajyakshma. Symptoms of Rajyakshma are Jwara, Kasa, Shwasa, Parshwashoola etc. Therefore the present study has been designed to evaluate the critical and complete understanding of etiopathogenesis of Rajayakshma based on the clinical as well as literature survey .by throwing a light of Ayurvedic concepts and modern view. Though there is difference in the pathogenesis of Rajayakshma and pulmonary tuberculosis the clinical picture of both is quite similar.

AIMS AND OBJECTIVES

To study the *Ayurvedic* concept of *Rajayakshma* (which affecting *Pranavaha Srotas*) etiopathogenesis with its correlation with the pulmonary tuberculosis

MATERIALS AND METHODS

Different *Ayurveda* texts, journals, research paper, authentic websites are refereed to study the concepts of *Nidana* and *Samprapti* of *Rajayakshma* w.s.r. to pulmonary tuberculosis.

Concept of Rajayakshma and pulmonary tuberculosis

In the classical texts *Acharyas* have classified mainly four main causative factors

- 1. Sahasa
- 2. Sandharana
- 3. Vegadharana
- 4. Kshaya

Other Nidanas like;

Aupasargika Nidana

Nidanartha Kara Roga

- 1. Sahasa Among the four Nidana of Rajyakshma Sahasa has been found as the prime etiological factor in every literature. It is also called Ayathabalamarambha, Balavadvigraha, Aghata, and Sanghata are the synonyms used for the Sahasa. Sahasa in the context of Rajyakshma may be not only physical work but also consist of certain atypical works like continuous speaking, studies etc. Various type of Sahasa Karmas are enumerated in Charaka Samhita;
- Langhana observing fast for a very long time
- Adhyayana reciting mantras loudly or continuous speech
- Plavana swimming for a long distance
- Adhwa walking long distance

- Vishwamachesta unusual/irregular activities
- Bhara Vahana carrying excessive weight
- Dhanusha Vyayachchana exertion with big bow
- Utsadana Padaghata restoring to forceful massage and application of pressure by feet
- Yuddha fighting with strong person
- Patina falling from height
- Abhighata subjecting oneself to trauma or assault

Sahasa - working beyond one's own capacity is Ativyayama. If a person indulges in such activities his chest gets injured (*Urakshata*) and due to that *Vata* vitiates and initiates the process of pathogenesis. *Urakshata* is given the prime importance in the pathogenesis of *Rajayakshma*

Urakshata - The concept of Urakshata can be considered in different dimension. Urakshata means Kshata/injury to the chest. This can refer to a direct traumatic injury to the chest or indirect injury due to non-traumatic causes. Pulomonary contusion causes immune dysfunction severe of splenocytes, macrophages and monocytes in different local compartments and systematically. Immunosupression is associated with an increased susceptibility to infectious complications. The initial defence against infection with mycobacterium tuberculosis once it reaches the lower respiratory tract is the alveolar macrophages. This cell is capable of inhibiting growth of the bacillus through phagocytosis which gets suppressed in chest injuries. The stress of exercise may have allowed a reactivation of the pathogens responsible for infection. During exercise exposure to airborne pathogens is increased due to higher rate and depth of breathing. An increase in gut permeability may also allow increased entry of gut bacterial endotoxins into the circulation particularly during prolonged exercise. Bouts of excess exercise cause temporary depression of various aspects of immune function like neutrophil, respiratory burst, lymphocyte proliferation etc. Within the respiratory tract, defense from pathogens is accomplished largely through the

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action of alveolar macrophages and the production of cytokines. The alveolar macrophage is an important cell of the innate defense system located within the respiratory tract that has the capacity to take up pathogens in a nonspecific manner. The macrophage can limit replication of pathogens thus limiting further spread of the infection.

- 2. Vega Sandharan It is also known as Vega Pratighata, Vega Samrodha and Gatirodha. One of the important Nidana of Rajyakshma, it is clarified that only the suppression of the urge of Mutra, Pureesha and Vata Vega are to be considered as Rajyakshma Hetu. Where the causative factor itself is an important stimulus for the aggravation of Vata urges are driven by Vayu present in different because of its Chala Guna. Suppressing the elimination of Mala leads to Mala Sanchaya. Mala Sanchaya results in Tridosha Prakopa. Suppression of Mutra, Mala and Vata leads to provokes Apanavata. Dushta Vata will further provoke Pitta and Kapha Dosha and may result in Rajayakshma.
- 3. Kshaya It is understood as Dhatu Kshaya in the context of Rajyakshma. Dhatu Kshaya especially as Sara Kshaya (Shudha Dhatu not formed). Rasa and Shukra are mentioned as etiological actor for Rajayakshma depletion of Ojus or Rasa present in the Hridya takes places in following way Anulomana and Pratilomana Kshaya

Anulomana Kshaya

Shoka Chinta Pratihata Hrudya - affliction of the heart of an individual with an extreme grief and worries, Krusho San Rukshannapanasevi - consuming Rooksha Anna Pana in emaciated individual, Irshya-Utkanta-Bhaya-Trasa-Krodha - affliction with envoy, worry, fear, sage etc. Krusho San Rukshannapanasevi. There is a relation between Hrudaya and Chetana, Manas, Rasadhatu, Vyana Vayu, Pranavayu, Ojus. Hence above psychological factor influences on them so Sneha Kshaya resulting into Vata Dosha Prakopa. This aggravated Vata further does Shoshana of Shareerik Dhatu leads to excessive Dhatu Kshaya leading to Rajayakshma. Durbalaprakriti Anaharo Alpaharo Va

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Bhavati - fasting or intake of food in lesser quantity by person who are weak in nature. Here person who has already in Dhatu Kshaya state where aggravated Vata is present and indulges in dry regimen or lack of food or no food which further deteriorate the conditions of Dhatus. Because of this body becomes Ksheena i.e., Durbala or Utsahopachyabalarahitah and helps in the manifestation of Rajayakshma. Acharya Charaka clearly denotes the influence of genetic susceptibility by saying Durbala Prakriti.Prakriti here is referred as Dehajanaka Beeja not Vataprakriti.

Pratiloma Kshaya - if an individual indulges in excess coitus, excess utilization of the formed *Dhatu* results in excess a state of need of excess formation of the *Dhatu*. When such over utilization prevails for a long time, it results in *Dhatu Kshaya*. Such *Dhatu Kshaya* is referred as *Pratiloma Kshaya*.

4. Vishamashana - Also known as Ashana Virasabhava, Annapana Vidhi Pratyaga. Food consumed in irregular quantity is termed as Vishamashana.lf Asthavidha Ahara Vidhi Vishesayatanas are not properly followed or Dwadasha Ashana Pravicharana is not taken into account while consuming Ahara, it leads to imbalance in the Tridosha and Dhatus will not get proper nutrition there by depletion of the Oius and helps to manifest Rajyakshama due to aggravation of Vata.

Role of nutrition in secondary immunodeficiency

Malnutrition can increase risk of tuberculosis. Under nutrition is not only risk factor of latent tuberculosis infection to active disease, but also increases the risk of drug toxicity, relapse and death once tuberculosis develops. The host protective immune mechanism of infection with mycobacterium tuberculosis depends on the interaction and cooperation between monocyte macrophage and T -lymphocyte and their cytokines. Increased risk of tuberculosis can result from alteration in the individual protective function of or the interaction between T-lymphocytes and macrophages because of nutritional deficiency. Micronutrients deficiency is considered to be the most ISSN: 2456-3110 REVIEW ARTICLE September 2022

frequent cause of secondary immunodeficiency and infection related morbidity including tuberculosis Vitamin A has immune-competent role in human tuberculosis. Vitamin A inhibits multiplication of virulent bacilli in cultured human macrophages and has a vital role in lymphocyte proliferation and in maintaining the function of epithelial tissues. Vitamin A is essential for normal functioning of T and B lymphocytes, macrophage activity, and generation of antibody response. Concentration of vitamin E and Vitamin C was found to be significantly lower in tuberculosis patients than healthy controls. Anemia is highly prevalent among adults with pulmonary tuberculosis and deficiency on Iron could contribute in the predisposition for infection

- 5. Nidanarthakara Rogas Besides this our major causes may disease act as like Jwara, Rakta Pitta, Pratishyaya and Kasa that can lead to Rajayakshma as their complication. It is also seen that during the disease like Prameha Gulma and Grahani the chances of Rajyakshma are increased. It may be because of Dhatu Kshaya and due to the chronicity nature of disease.
- 6. Adibala Pravrutti Pradusta Beeja/ Shonita or Beejabhagavayaya of parents if gets afflicted with the pathology of Rajyakshma, then any progeny born in them are suffers from it. Atharveda also supports by considering it under Kshetreeya Vyadhis.
- 7. Upasarga The infectious nature of the disease was clearly recognized by Sushruta included in the list of Aupasargika Rogas or contagious disease or endemic in disposition. These are transformed from one person to other by the familiarity of infectious patient.

Samprapti

Acharya Charaka has mentioned the pathogenesis of all the four types of Rajayakshma in detail in Nidana Sthana. However, a common pathogenesis has been described in Chikitsa Sthana.

Other Acharyas have mentioned pathogenesis in two ways Anulomana Kshaya and Pratiloma Kshaya. Rajayakshma is primarily attributed to Dhatu Kshaya

Samanya Samprapti

- Srotasam Sannirodhat
- Raktadeenam Cha Sankshyat
- Dhatushmana Cha Apachayat

Srotasam Sannirodhat - Acharya Charaka says that when Agni is in proper form it lead to proper formation of subsequent Dhatus and maintain it. But when there is Srotorodha / obstruction primarily takes place in Rasavaha Srotas (Adhyadhatu) that lead to the formation of Ama. Rasa Dhatu is also responsible for Dhatu Poshana. The nutrient materials conveying to the tissues gets obstructed in their channels by the vitiated Dosha responsible for the caution of the Yakshma 'Yakshmakaraka Dosha hindering the process of nourishment of tissue fundamentals.

Chakrapanidutta emphasizes upon the word 'Yakshmakaraka Dosha' implying a special form of vitiated Dosha, which are neither exacerbated nor depleted i.e., Roopantarita or deformed Dosha. Tridosha Prakopa is responsible for the Srotorodha among the Tridosha particularly Kapha Dosha is responsible for Srotosannirodha.

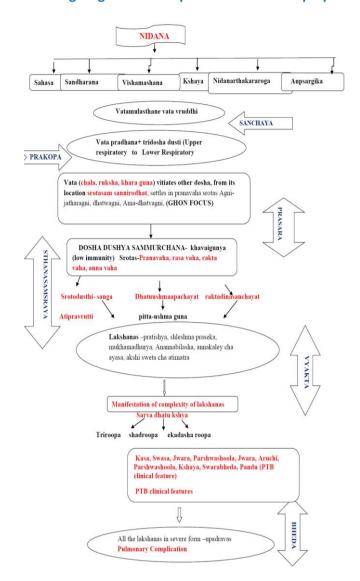
Srotorodha has got three important implications on the body;

- As a result of Srotorodha Dhatu Poshana doesn't takes place hence results in Dhatu Kshaya.
- Secondly due to inadequate *Dhatu Poshana /* nourishment to the *Dhatu* during the process of metabolism of the *Dhatu*, *Dhatu Paka* ensures and results in *Dhatu Kshaya*.
- Thirdly due to Srotorodha to Rasavaha Srotas the Ahara Rasa cannot enter the Rasavaha Srotas and will remain in Kostha. As a result, Ahara Rasa remain as a part of Pureesha.

Raktadeenam Cha Sankshayat - The stable tissue elements like Rakta etc. due to obstruction to the passage of nutrient material or Srotamsi and due to insufficiency of Upadana Rasa, it gets depleted as these Rasa and Srotamsi provide nourishment to Dhatu. The reason behind depletion of this, Rasa containing Dhatvahara during the course of disease is at that time whatever the food is digested in the Koshta by Jatharagni is reduced to Mala or waste products and very little contributes to the formation of Ojus or Sara Bhaga of Rasa. There will be hindrance of Jatharagni due the nature of the disease as it is influenced by vitiated Dosha chiefly Kapha such Ahara Rasa produced is insufficient to maintain or to nourish the tissue elements due to incomplete transformation. Therefore, in a Rajayakshma patient always concern should be taken particularly against the Malarakshana because Balamtasya Hi Vid Balam.

Dhatu Ushmana Chayapachayat - Normally the Dhatu of body gets metabolised by their own Ushmas or Dhatwagni / Dhatuushmana (transforming enzymes). From these Dhatu the other Dhatu get nourished through their respective Srotas (channels of circulation) e.g. - a Poshaka Rasa Dhatu would nourish the Rakta Dhatu once however if there is any obstruction to Srotas or if there is diminution of stable tissue elements like Rakta or if there is diminution of Dhatu Ushma or Dhatvagni then Rajyakshma is manifested. According to Acharya Sushruta Prakrit Pitta is responsible for Paktikrita, Ragakruta, Ojokrita, Tejakrita, Ushmakrita. Acharya Chakrapani mention Ushma as Ushmana Rasagniadirupena Tryodashavidehan. Apachaya of Agni that leads to improper catabolic reaction. Each Dhatu has its own Agni and is called as Dhatwagni. In a healthy person Dhatwagni helps to maintain the Dhatu and Dhatukarma. From the Ahara Rasa, all the Dhatu are nourished and in turn the essence of Dhatu i.e., Ojus is formed. Due to improper Preena by Rasa, Dhatu Poshana will be inadequate and Dhatwagni Mandya ensures. As a result, Dhatu Kshaya, Ojo Kshaya takes place and may manifest Rajyakshma and reduce the immunity of the body.

Showing diagrammatic representation of Samprapti



Shad Kriya Kala

Sanchaya - Nidana Sevana - Chaturvidha Nidana, Nidanartha Kara Roga etc. lead to excessive aggravation of Vata Dosha in its Moola Sthana "Vatamulasthane Vata Vruddhi." Symptoms of Vata Dosha can be observed at this stage.

Entry of microorganism - inhalation, ingestion, inoculation etc. accumulation of droplets containing mycobacterium tuberculosis in upper respiratory.

Prakopa - In this stage *Vata Dosha* quantitatively increase starts to flare out and spread to other *Sthanas*. Medium sized droplets are trapped in the mucosa of the upper respiratory tract from where they cleared without causing infection - primary infection.

Tiny droplets <25 um in diameter escape the trapping mechanism.

Prasara - Prakopa stage followed by Prasaravastha in which the vitiated Vata along with its Chala, Ruksha, Khara Guna vitiates other two Doshas (Pitta and Kapha) from its Sthana Srotasam Sannirodhat, settles in Ura Pradesha affecting Pranavaha Srotas, Annavaha, Rasa Vaha Srotas. Lina Marga Tisthatighon focus (primary tuberculosis), bhuyo Hetu Pratikshina - waiting for stimulating / precipitating factor the small size particles escaping the trapping mechanism and reach the lung. It can be understood as spreading of upper respiratory tract infection to lower respiratory infection. Bacteria is transported to alveoli.

Primary infection occur/latent tb

"Ghon focus"- phagocytosis of bacteria by neutrophils and macrophages.

Cell mediated immunity gets activated, surrounds the cell to forms granuloma (3 weeks)



Leads to necrosis of tissue at infection site



Term as Ghonfocus

Sthana Samsraya - Important stage for "Dosha Dushya Sammurchana". Vitiated Vata Dosha produces start affecting Dhatu and Srotas Vitiated Vata due to Chala, Ruksha, Khara Guna it starts making Shoshana of Sthayi Dhatu, restrains and weakens them leads to Asamyak Hetu Vyuhana Karma due to Srotorodha (Gati Avarodha) leads to Dhatu Kshaya. Due to more susceptible or less immuned place created in Pranavaha Srotas by Nidana, the tubercle bacilli accumulate and when it gets the favourable condition it manifest the symptomatology.

Sthansamsraya can also be understood in 2 stages

- a) Khavaigunya In Ura Pradesha
- b) Ghon focus

Due to again *Nidana Sevana*, adequate exposure, environmental trigger immunocompromised patient, smoking etc. leads to subsequent infection occurs in a

sensitized individual who possess immunity give rise to Post Primary Tuberculosis, decrease *Vyadhi Kshamatva* (*Vikrita Shleshma - Avalambaka Kapha*)

- c) Alveoli
 - i. Kshata lungs
 - ii. Kshobha Prana Vaha Srotas

Ghon complex (Latent T.B).

Immune response compromised - Reactivation of latent TB

Immune response persist - Clearance of latent infecton

Vyakta - Different abnormalities produced in the previous stage leads to the production of symptoms in Vyakta stage and produces complexes of symptoms respectively Srotas involved. The symptoms produced are themselves as an individual disease entity, the Rajyakshma produced out of it is an assortment of diseases. Acuteness of aggravation of Tridosha depends on the strength as well as the number of causative factors. Doshas of Alpa Bala produce 3, 4, 5 Lakshanas, Doshas of medium strength produces 6, 7, 8, 9, 10 Lakshanas and Doshas having full strength produce 11 symptoms.

Lakshanas like - Kasa, Swasa, Aruchi, Jwara, Parshwashoola, Swarabheda.

Pulmonary symptoms - Cough, Dysponea, Chest pain, Pleural effusion, Wheezing, Fever, Hemoptysis

Bheda - In certain condition like if there is absence of proper treatment the disease advances and *Upadrava* appear and make the disease not possible for treatment.

Gulma, Mutrakrichra, Uroruja, Apasmara, Unmade Udararoga , Murchana, Pandu, Uroruja Nisthivana

Pulmonary complication - Complication can occur as the initial manifestation of the disease, during the course or any time after complete or incomplete treatment. They are - Hemoptysis, Pleural complications such as - Dry Pleurisy, Pleural Effusion, Empyema Bronchiectasis. Tuberculous Laryngitis, Super-Aided Fungal Infection, Carpulmonaly, COPD, Tuberculous Meningitis, Pericarditis, Enteritis.

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CONCLUSION

Rajayakshma is an age old Tridoshaja Vyadhi with the dominance of Vata and Kapha Dosha. Here all the Sapta Dhatus are involved in the manifestation of the disease whereas all the dhatus are in Kshaya Avastha. Rajayakshma is respiratory dominant pulmonary tuberculosis when Pranavahasrotas is involved. When Rajayakshma Samprapti with tuberculous positivity happens in extra pulmonary organs and tissues then respective Srotas wise Rajaykshma has to be understood like when it affecting the Amashaya -Abdominal TB, when Doshas affecting the bone skeletal TB, when Doshas are affecting the Shira meningeal TB. Rajayakshma in the current scenario has to be diagnosed in two ways i.e., Tuberculosis infection positive Rajayakshma and negative Rajayakshma immunological Rajayakshma just like sero positive and sero negative rheumatoid arthritis. The Chaturvidha Nidana explained in the classic mainly it indicates towards the predisposing factors that lead to decrease immunity and make the person more susceptible for infection. In understanding of Rajayakshma with reference to the modern science it can be understood as sputum AFB +ve Rajayakshma and sputum AFB -ve Rajayakshma.

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