



“ELUCIDATING DESCRIPTION OF PNEUMOTHORAX (PRIMARY AS WELL AS TUBERCULOSIS ASSOCIATED SECONDARY) IN AYURVEDA AND HIGHLIGHTING ITS NON-SURGICAL MANAGEMENT THROUGH HERBS”

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ABSTRACT

Background: Pneumothorax is an abnormal collection of air in pleural cavity. Its Incidence is considerably increasing in past decades due to contributing factors like smoking. Although it is not a fatal disease and it rarely causes death but the rate of recurrence are high (~35%). Pneumothorax attracts consideration because it causes atelectasis and may affect one or both lungs. Presently used conventional interventions like chest-tube drainage, needle aspiration, chest tubes and pleurodesis for management of pneumothorax have limited role and unable to revert the pathogenesis. All these invasive treatment modalities have sparse evidence to prove their effectiveness and safety. Therefore it is required to search some non-invasive, safe and effective management. Herbs are always prove to be best alternative for providing safe, effective and cost effective management and therefore we hunt classical Ayurvedic text which are the treasure of herbs to find out solution. Description of Primary & Secondary Pneumothorax in classical Ayurvedic text is really incredible. In Ayurvedic classical text Charaka Samhita, 11th chapter named “*Kshata-Kshina chikitsa*” gives the detailed description of primary as well Pneumothorax associated with tuberculosis. This chapter is reinstated by Acharya Drdhabala as the original Agnivesa’s work redacted by Charaka is not being available. **Aims and objectives:** This paper is designed for critical and constructive analysis of the Ayurvedic literature to identify the potential research areas for development of safe, non-invasive and non-surgical management of pneumothorax and search the relation between immunity, tuberculosis and pneumothorax. **Material and methods:** This is a narrative review article which comprises the extended explanation of *Kshata-Kshina* available in Ayurvedic texts and its comparison with contemporary complement medicine. The article reviews the literature and tries to concisely reproduce the concept of pneumothorax in original classical terms. **Result and Conclusion:** Reviewing literature reveals that asthenic patients who are involved in exhaustive physical work are more prone for developing pneumothorax and if the proper management is not given timely it can cause permanent lung damage and complicates as tuberculosis (an immune-compromised state superadded with infection). Immunity plays a determining role in deciding progression of the disease. Herbs having adhesive and hemostatic properties are beneficial in acute management of primary pneumothorax.

KEYWORDS: tuberculosis, pulmonary- renal syndrome, autoimmunity.

INTRODUCTION

Abnormal collection of air in pleural cavity is known as Pneumothorax. Broadly it is of two types – Primary or Spontaneous Pneumothorax, which occurs suddenly without an apparent cause and in absence of any significant lung disease, while a secondary pneumothorax occurs in the presence of existing lung disease. The commonest cause of secondary pneumothorax is chronic obstructive pulmonary disease (COPD) which account for approximately 70% of cases (major contributing factor is smoking, which increases the likelihood by 22 times in men and by 8 times in women). In developing countries like India, Tuberculosis is the major infectious disease contributing to secondary

pneumothorax. Primary Pneumothorax is usually caused by physical trauma to the chest and referred as traumatic pneumothorax. In some cases traumatic pneumothorax may complicate as tension pneumothorax which is a medical emergency and require prompt treatment to prevent death. Symptoms typically include chest pain, shortness of breath and sometime hemoptysis. Description of similar disease termed as *Kshata-Kshina* is available in Ayurvedic text- Charak Samhita. *Kshata Kshina* is comprises of two words viz. *Kshata* and *Kshina*. The term can be interpreted in two ways as *Kshata* causing *Kshaya* or a disease having both *Kshata* as well as *Kshaya* i.e. *Kshata* and *Kshaya* simultaneously. *Ksaya* is used as a synonym of

Rajayakshma. Amarkosa has drawn a parallel meaning between “Sosa” “Kshaya” and “Yakshma”. *Kshaya* means inability to perform physical activities due to excessive debility. According to both, Acharya Charaka (Ch.Ni.6/8-9) as well as Acharya Sushruta (Su. Ut. 41/10) this depletion of *dhatu*s can take place by two ways that can be termed as (i) *Anuloma Kshaya* and (ii) *Pratiloma Kshaya*.

Now let us try to understand the meaning of second word- *Kshata* and its significance as a disease. *Kshata* means trauma or injury. *Sahasajanya Rajayakshma* cause *kshata* in the *urah* similarly in *Kshataja kasa* also there is *urahksata*. Thus there are three place where *urahksata* is encountered in Ayurvedic texts namely- *sahasajanya Rajayakshma*, *kstaja kasa* and *ksata Kshina*. Let us examine the similarity between these three conditions, to draw a conclusion:-

Similarity between the *Nidana* (etiological factors) of *Sahasajanya Rajayakshma*, *Ksata-Kshina* and *Kshataja Kasa*

<i>Nidana</i> of <i>Sahasajanya Rajayakshma</i>	<i>Nidana</i> of <i>Kshata-Kshina</i>	<i>Nidana</i> of <i>Kshataja- Kasa</i>
1. Battle, 2. Excessive reading, 3. Lifting heavy weight, 4. Covering a long distance, walking on foot, 5. Excessive swimming, 6. Jumping, 7. Falling from high altitude, 8. Excessive trauma. युद्धाध्ययनभाराध्वलङ्घनप्लवनादिभिः। पतनैरभिघातैर्वा साहसैर्वा तथाऽपरैः। (Ca.Ci. 8/14)	1. Fighting with stronger person, 2. Reciting scriptures at the top of voice, 3. Lifting heavy weight, 4. Covering a long distance walking on foot, 5. Crossing a big river by swimming, 6. Sudden long and high jump, 7. Falling while walking over uneven place or from high altitude, 8. Being excessively injured by other violent and cruel acts.	1. Fighting with stronger person, 2. Excessive battling 3. Lifting heavy weight 4. Excessive walking, covering a long distance walking on foot, 5. Fighting with strong animal or try to restrain them, 6. Excessive sexual indulgence. अतिव्यवायभाराध्वयुद्धाश्वगजविग्रहैः। (Ca.Ci. 18/20)

Similarity between the *Samprapti* (Pathogenesis) of *Sahasajanya Rajayakshma*, *Kshata-Kshina* and *Kshataja Kasa*:

<i>Samprapti</i> (Pathogenesis) of <i>Sahasajanya Rajayakshma</i>	<i>Samprapti</i> (Pathogenesis) of <i>Kshata-Kshina</i>	<i>Samprapti</i> (Pathogenesis) of <i>Kshataja Kasa</i>
Indulgence in strenuous physical activity causes injury to the chest. अयथाबलमारम्भैर्जन्तोरुरसि विक्षते।	<i>Kshata kshina</i> gets manifested as a result of the injury to the chest due to the excessive strenuous physical activity.	Indulgence in strenuous physical activity causes injury to the chest. रुक्षस्योरः क्षतं वायुर्गृहीत्वा कासमावहेत्। (Ca.Ci. 18/20)

Similarity between the Clinical Features of *Sahasajanya Rajayakshma*, *Kshata-Kshina* and *Kshataja Kasa*

Clinical Features of <i>Sahasajanya Rajayakshma</i>	Clinical Features of <i>Kshata-Kshina</i>	Clinical Features of <i>Kshataja Kasa</i>
1. Chest pain 2. Cough 3. Hemoptysis, along with other 8 symptoms.	1. Chest pain 2. Cough 3. Hemoptysis May accompanied with <i>Atisara</i> (Ca.Ci. 8/16)	1. Dry cough followed by hemoptysis, 2. Pricking, sharp, piercing, tearing, intense chest pain, 3. Fever (<i>jvara</i>), dyspnea (<i>shvasa</i>), morbid thirst (<i>trishna</i>), and change in voice (<i>vaisvarya</i>) is also present.

Examine the etiological factors, pathogenesis and clinical features it is clear all the three disease have same etiopathogenesis as well as clinical manifestation. Now the question arise that if all these three disease are same then what is the reason for their separate description? To answer this question it is necessary to explore the distinction between these three diseases. The main

difference between these three appears in their management as follows:

Difference in the treatment of *Sahasajanya Rajayakshma* and *Ksata-Kshina*

Treatment of <i>Sahasajanya Rajayakshma</i>	Treatment of <i>Ksata-Kshina</i>	Treatment of <i>Kshataja Kasa</i>
1. Management of <i>Sahasajanya Rajayakshma</i> is not mentioned separately, 2. Management is given according to the symptoms, 3. For the management of <i>Kasa</i> and <i>Parsvasula</i> present in all types of <i>Rajayakshma</i> external as well internal treatment is given. 4. Mild <i>vamana</i> and <i>virecana</i> is directed to use 5. Use of different types of <i>svedana</i> like <i>nadi</i> , <i>samkara</i> , <i>pariseka</i> is indicated (Ca.Ci.8/71-76), 6. <i>Raktamoksana</i> is indicated in <i>Parsvasula</i> (Ca.Ci.8/82) 7. Use of external applications like <i>pradeha</i> , <i>aalepa</i> , <i>pariseka</i> , etc is given. 8. Use of <i>Sandhaniya</i> drugs like <i>laksha</i> , <i>madhuyasti</i> is not mentioned.	1. <i>Atyayika cikitsa</i> (emergency management) is given for management, 2. Use of <i>Sandhaniya</i> , <i>jeevaniya</i> , <i>brnhaniya</i> drugs like <i>laksha</i> , <i>madhuyasti</i> , <i>amalaki</i> , <i>vidarikanda</i> , etc. is mention 3. Use of hemostatic drugs is mention 4. Direction are given to use <i>Samtarpana</i> and <i>vrsya cikitsa</i> 5. <i>Pancakarma</i> is not indicated. 6. <i>Dhumapana</i> is not indicated.	1. <i>Atyayika cikitsa</i> (emergency management) is mention to use, 2. Use of <i>jeevaniya</i> and <i>brnhaniya</i> drugs like <i>ghrta</i> , <i>kseera</i> , etc. is mention 3. Use of <i>Dhumapana</i> when the traumatic injury heals. 4. Use of <i>Sandhaniya</i> drugs like <i>laksha</i> , <i>madhuyasti</i> is not mentioned. 5. <i>Pancakarma</i> is not indicated.

From the above table it is obvious that *Kasa* appears in *Kshataja Rajayakshma* is elaborated under the heading of *Kshataja Kasa*. As the *Sahasajanya Rajayakshma* is a very serious and emergency condition and which management is lacking in the chapter of *Rajayakshma* therefore its emergency management is described in a separate chapter under the heading of *Ksata Kshina*. Use of *Sandhaniya* drugs like *laksha* (mainly indicated for the healing of fracture of bone) and *madhuyasti* clearly indicates that in *Ksata Kshina* there is external trauma (ribs fracture leading to pneumothorax) that should be managed with quick remedies. As Acharya has given only conservative management for the *Ksata- Kshina* it excludes the possibility of surgical interventions in *Ksata-Kshina* (tube drainage with or without medical pleurodesis, vacuum-assisted thoracostomy (VATS) with pleurodesis and/or closure of leaks and bullectomy, and open surgical procedures such as thoracotomy for pleurectomy or pleurodesis) at that time.

All the mentioned etiological factors for *Kshata- kshina* can be divided into two categories viz. (1) exogenous factors related to over-exertion/ strenuous malpractice of physical activity that causes trauma to the lung tissues, (2) endogenous factors related to malnutrition that causes depletion of body tissues. The etiological factors described for *Kshata* are related to those that causes spontaneous lung injury and the clinical feature suggests that it is a condition of Pneumothorax. Studies showed that strenuous athletic activities like vigorous swimming, heavy weight lifting, jolting, etc. can cause Pneumothorax (PTX) and pneumomediastinum (PTM). Although they are rare, when they occur they can be life-threatening, requiring immediate diagnosis and treatment. The description given by Acharya is the

description of Peunothorax due to traumatic tears in the pleura following chest injury as well primary PTX that may complicate into secondary one if prompt management is not given. PTX can be categorised as spontaneous, traumatic or iatrogenic. Spontaneous can be further subdivided into primary or secondary depending whether the underlying lung disease is absent or present respectively. Traumatic PTX can be further subdivided into penetrating or nonpenetrating trauma.

A case of spontaneous PTX in a basketball player was reported by Curtin and colleagues^[1] who presented with acute onset of left-sided chest pain. The pain increased during a pregame warm-up, and the examination was remarkable with a heart rate of 60, respiratory rate of 12, blood pressure of 120/70 and decreased breath sounds in the left upper lung field. A chest radiograph confirmed a large left-sided PTX. The athlete was treated with chest tube placement for 2 days, was discharged from the hospital 3 days later, and was allowed to return to full play at 3 weeks.

Traumatic PTX can be associated with penetrating or nonpenetrating trauma, with associated fractures being common. Rib fractures are common, and certain rib segments that are associated with a higher likelihood of associated injuries and complications include the first four ribs, the last two ribs, fracture of multiple ribs and flail segments.^[2] Because rib fractures in children require a greater impact force to occur, these injuries are often associated with a higher morbidity and mortality.^[3] The reported incidence of PTX is association with scapular fractures is between 11% and 38%^[4,5], although in one study it occurred in 16 of 30 patients with scapular fracture.^[6]

Spontaneous PTX has been reported in joggers^[7], weight lifters^[8,9], scuba divers^[10] and basketball players.^[11] Traumatic PTX has been reported in several sports as well, including football^[11,12,13], hockey^[12], diving^[14], boxing^[15], soccer^[16], weight lifting^[17] and fencing.^[18] Traumatic PTX in sport in association with various fractures have also been reported, including rib fractures^[1], scapular fractures^[3,19] and clavicle fractures.^[20] PTM has also been reported during sporting activities; these injuries are most often associated with trauma, fractures and PTX.^[21,22] Spontaneous PTM has been observed in sport, but there is only one report of this.^[4] The largest series of PTX in sport was reported in 1999 by Kizer^[23], in which 20 cases of confirmed PTX over a 5-year span were retrospectively reviewed. All of these occurred during winter sports participation and were presented to a community hospital in the Lake Tahoe area. In 19 cases (95%), PTX was due to blunt chest trauma. Nine different sports were involved, though 55% of the cases occurred during skiing or snowboarding, most likely a result of the patient population in this community.

Ciocca^[18] reported on a dramatic case in which the presentation of PTX was delayed for 3 days. This case involved a weight lifter who developed symptoms of dyspnea, right-sided chest pain and feeling as if his "wind had been knocked out" after "bouncing" a bar of his chest during a bench press. This athlete continued to lift weights, continued with activities of daily life and felt his symptoms would go away, and finally sought medical attention after 3 days because the symptoms had not cleared. Chest radiographs confirmed a large right-sided PTX with total collapse of his right lung (Fig.1).



Fig. 1. A postero-anterior chest radiograph of a 27-year-old weight lifter revealed a large right-sided pneumothorax with collapse of the lung. The diagnosis is confirmed by an absence of lung markings peripheral to the visceral pleural line. (From Ciocca M. Pneumothorax in a weight lifter. Phys Sportsmed 2000;28; with permission.)

Ferro and McKeag^[4] reported on a case of PTM during breath-holding exercises in a 19-year-old swimmer. The athlete reported mild right-sided neck pain during the

practice and was given ibuprofen by the athletic trainer. Two days later, after the first swim meet, the athlete reported increased pain, shortness of breath and difficulty swallowing and was subsequently referred to the emergency department. Bloodwork, radiographs and a barium swallow were all performed and read as normal, though on the following day the radiologist confirmed PTM (Fig.2).

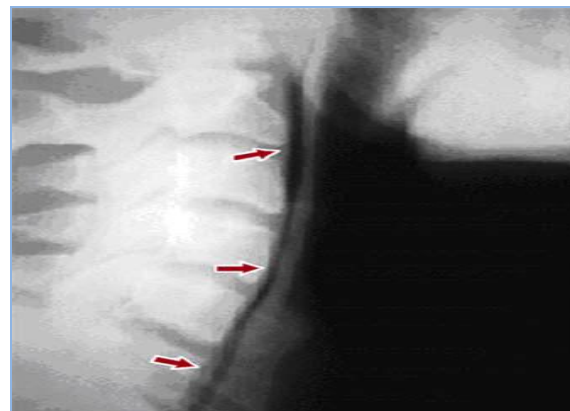


Fig. 2. A lateral cervical-spine radiograph in a 19-year-old male college swimmer reveals air in the deep cervical tissues behind the trachea and larynx (arrows) posterior to the nasopharynx. (From Ferro RT, McKeag DB. Neck pain and dyspnea in a swimmer. Phys Sports Med 1999;27; with permission.)

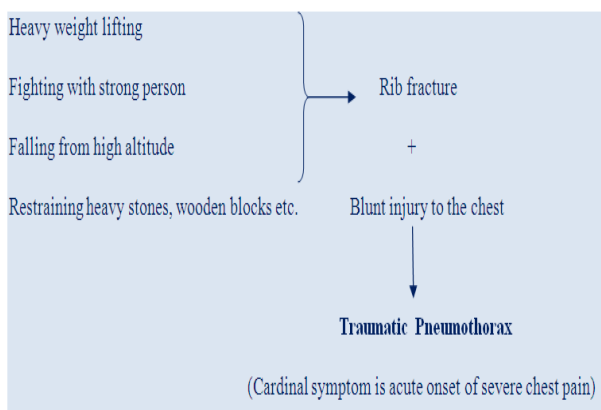
Traumatic injury to the lungs like ribs fracture or fracture of scapula during strenuous physical activity like mentioned above causes traumatic pneumothorax sometime it is also due to sudden change in atmospheric pressure leading to rupture of sub-pleural blebs or bullae (dilated peripheral air sacs) usually located in the apical portion of the lung into the pleural cavity.

The parietal and visceral pleura are normally separated by a potential intrapleural space with a negative pressure between (-) 10 to (-) 12mmHg during inspiration and (-) 2 to (-) 4mmHg during expiration. Negative pressure as high as (-) 80 to (-) 100 mmHg may be generated during coughing, sneezing or straining. Any break in the alveolar/ pleural barrier allows air to escape into pleural space. Consequently, the normally negative intrapleural pressure (which keeps the lung expanded) increases (becoming less negative/ or even positive) allowing the pulmonary elastic recoil pressure to collapse the lung. This result in an impairment of ventilation with decrease in total lung capacity and vital capacity. Along with these ventilator changes, blood is shunted through the unventilated portions of the lung resulting in hypoxaemia.

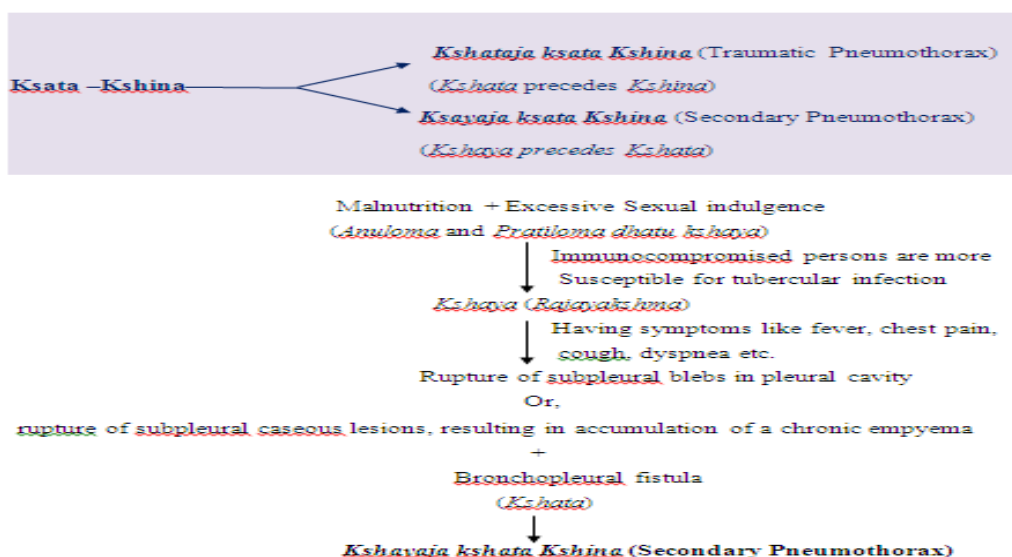
The clinical features described for Pneumothorax shows close resemblance with the clinical symptoms of *Ksata* like dyspnea and pleuritic chest pain. These symptoms are generally present in 80% to 90% of PTX patients, though up to 10% of patients will be asymptomatic^[24]

(*Avyaktalakshana*). The chest pain is usually ipsilateral and may radiate to the shoulder, neck and into the back. It is often pleuritic, associated with dyspnea on exertion, or a dry cough.^[11] The characteristic of chest pain in *Ksata* that is typical to PTX is beautifully explained by Acharya Caraka in Chapter 18th of Cikitsa sthana while the description of *Kshataja kasa* (Ca.Ci.18/20-23). Acharya says that chest pain in *Kshataja Kasa* is pricking (*sucibhiriva*), sharp (*tiksna*), piercing (*tudhyamanena*), tearing (*bheda*), intense, accompanied with burning sensation (*abhitapina*) and tender (*dukhasparsena*). The pain is accompanied with *svasa* (dyspnea), *jvara* (fever), *parvabheda* (pain in joints), *vaisvarya* (change in voice, diminished voice sounds -Laennec's signs). The characteristic feature of *Ksata Kasa* is *Paravata evakujana* (producing pigeon like sound) that can be correlate with characteristic "crunching sound" on auscultation over the pericardium synchronous with the heartbeat (Hamman's crunch) in PTX.

Thus combinig the clinical features described by the Acharya for *Ksata* and *Kasa* associated with *Ksata* i.e. *Kshataja Kasa* clearly depicted that it is decription of Traumatic Pneumothorax.



The second category of etiological factors is *Apara nidana* of *Ksata Kshina* (secondary causes). Those who



are malnourished (taking improper and little quantity of food – *rukshalpapramitasinah*) and indulge in excessive sexual act are susceptible for developing secondary *Ksata* – *Kshina*. In chapter 18th of Chikitsa Sthana (C.Ci. 18/25-28), Acharya describe the clinical features of *Ksayaja Kasa* as- cough with foul smelling (*durgandha*), mucopurulent (*pyuopamkapham*) sputum associated with hemoptysis (*raktam*). The patient is lean and thin (*durbala*) with loss of body weight (*krisha*), having pallor eyes (*srinaddarsanalocana*), mixed type of fever, chest pain (*parsvaruka*), rhinitis (*pinasa*), recurrent diarrhea (*bhinnasahantvarcastvam*) and hoarseness of voice (*svarbheda*).

Critical analysis of the symptoms described by Acharya shows its resemblance with tuberculosis, for example presence of foul smelling sputum may present in tuberculosis, bronchiectasis, etc. but presence of foul smelling mucopurulent sputum with fever, diarrhea, chest pain and rhinitis is typically characteristic feature of tuberculosis. Tuberculosis is a cluster of disease that involves both pulmonary as well extrapulmonary tissues. Hampered immunity made individual more susceptible for developing complications in tuberculosis.

The same clinical features as described above in *Ksayaja kasa* by Acharya are depicted in secondary *Ksata Kshina* viz. chest pain (*uro virujyate*), fever (*jvara*), diarrhea (*vidabheda*), foul smelling excessive muco-purulent sputum (*dustah, syavah, sudurgandhah, pito vigrathito, bahu*), cough (*kasa*), hemoptysis (*sarakta*).

Moreover Acharya says that patients of *Kshata Kshina* should be given regimens prescribed for *Rajayakshma*, *Raktapitta* and *Kasa*. Thus it is clear that Acharya use *Kshaya* as a synonym of *Rajayakshma* and in this chapter he described the complication of *Rajayakshma* like secondary pneumothorax and renal impairment.

Pneumothorax is a well known complication occurring in cavitary tuberculosis. In patients having poor defense mechanism due to malnutrition, intercurrent disease, corticosteroid or immunosuppressive drug therapy life threatening complications of tuberculosis like pneumothorax may develop. Studies showed that incidence of tubercular pneumothorax are continuously increasing in developing countries. Rupture of sub-pleural bleb in apical part of lung causes secondary pneumothorax in tuberculosis with the acute onset of dyspnea and sever chest pain. This is an emergency condition and required prompt treatment.

Some scholar hold the view that there may be two separate diseases, as clinical features of *Kshata* and *Kshina* are separately described, in such case it may be defined as secondary complication of tuberculosis like secondary pneumothorax and genitourinary tuberculosis. Genitourinary tuberculosis is the most common cause of painless hematuria in India and other developing countries. Genitourinary TB is commonly a late manifestation of an earlier symptomatic or asymptomatic pulmonary TB infection.^[25] A latency period ranging from 5 to 40 years between the time of the initial infection and the expression of genitourinary TB frequently occurs.^[26] As one of the most common sites of involvement of extrapulmonary TB, genitourinary TB accounts for 15% to 20% of the infections outside of the lungs.^[27] Overall, worldwide 20% to 73% of extrapulmonary TB is genitourinary and found in the urine of 15% to 20% of the individuals infected with TB.^[28] While the development of effective interventions has decreased the incidence of pulmonary TB, the number of extrapulmonary cases has shown little change.^[29]

The cortical granulomas may remain dormant, asymptomatic and stable as sequel of a primary pulmonary infection from as long ago as 10 to 15 years.^[30] Renal tuberculosis may occur as a result of reactivation after this period of dormancy, even when there is no evidence of active pulmonary tuberculosis, or it may be due to reinfection from active tuberculosis.^[31] A study by Kenney^[32] concluded that only 30% of the clients presented with active TB along with an abnormal chest x-ray, while 10% showed signs of active pulmonary TB. Christensen^[33] reported that active pulmonary TB does not usually accompany renal TB: the majority of the clients diagnosed with renal TB did not exhibit any respiratory symptoms.

The second possibility holds the idea of accepting *Ksata-Kshina* as a singular disease i.e. a single disease having hemoptysis and hematuria. Accepting this possibility shows its resemblance with cluster of autoimmune disorders related to **Pulmonary- Renal Syndrome**. Few examples of Pulmonary- Renal Syndrome accountable for situation similar to the *Kshata- Kshina* are: **IgA nephropathy** (also known as Berger syndrome) 2.

Goodpasture syndrome, 3. Granulomatosis with polyangiitis (GPA).

The precise etiology of all the above mentioned autoimmune disorders is unknown. Though genetic susceptibility, recurrent infection and immunocompression are attributed to some extent causing these diseases but exact cause is not known.

Neck to neck correlation of Ayurvedic terminology and modern disease is not possible as it creates controversy and therefore it is better to understand the pathophysiology of diseases with both vision to have clear concept and easy understanding of disease.

Herbs used for Management of *Kshata- Kshina*

Herbs used for the management of *Kshata-Kshina* can be classified in two category viz. (1) having antioxidant properties and (2) having hemostatic and bone healing properties.

Drugs having anti-oxidant properties

Nagabala (*Sida veronicaefolia*) is an Ayurvedic herb, used for relieving *Vata* imbalance, for aphrodisiac and rejuvenative effects.

Controversies over Nagabala

The controversy on Nagabala or Gangeruki seems to be relatively recent. Chakrapani considered Gangeruki as Nagabala Fruit [C.S 27/142]. In this context Gangadhara clarified that this plant is also known as Guda sarkara. In another context Chakrapani described Nagabala as Goraksa Tandula (S.S. Su 15/33). Sivadas sen also opined that Nagabala is Goraksa Cakuliya. Another commentator Adhamalla also mentioned that Nagabala and Guda sarkara are the synonyms of Gangeruki.

From the above finding it is apparent that the controversy started with the synonym / vernacular name Guda sarkara which is *Grewia* species. Thakurji described that different plants viz. *Sida spinosa*, *Sida veronicaefolia*, *Urena lobata*, *Grewia populifolia* & *Grewia hirsuta* have been accepted as Nagabala at various places.

Gangeruki and Guda sarkara may be the two species of *Grewia* i.e. *Grewia populifolia* and *Grewia hirsuta* respectively. Therefore Nagabala can be accepted as *Sida veronicaefolia*.

- **Antioxidant property of *Sida veronicaefolia***

The phytochemical screening of plant extract showed positive reaction for psuedotannins, flavonoids, phenolic acid, choline and oxalic acid. Research studies showed that hydro alcoholic extract of *Sida veronicaefolia* displayed strong antioxidant activity and it is suggested that it could be a potential source of natural antioxidant that could have great importance as therapeutic agents in preventing or slowing the progress oxidative stress related degenerative diseases.^[38]

- ***Emblca officinalis* (Amalaki)**

Research studies showed that *Emblca officinalis* has high content of natural antioxidants. The antioxidant effects have also been evaluated in comparison to the real levels of Vitamin C by different antioxidant tests. The data obtained show that the *Emblca* fruit contains ascorbic acid (0.40%, w/w). It has also been found that Vitamin C accounts for approximately 45–70% of the antioxidant activity.^[39]

- **Laccifer lacca (Laksha)**

Action and Uses: Adhesive, haemostatis and is useful in fracture and osteoporosis.

Shellac Introduction

Lac are scale insects (*Laccifer Lacca*) which live on trees called lac host trees where they secrete the lac resin which is scraped off and manufactured into shellac. To produce just 1 kilogram of lac resin around 300,000 insects lose their tiny lives. A scale insect is a common name for any of about 2000 insect species found all over the world that attach themselves in great numbers to plants and trees. Scale insects range from an almost microscopic size to more than 2.5 cm. They can be very destructive to trees - stunting or killing twigs and branches by draining the sap. Lac is the resinous protective secretion of the tiny lac insect. The major constituent of stick lac is the resin (70-80%); other constituents present are: sugars, proteins and soluble salts - 2-4; colouring matter - 1-2; wax - 4 -6; sand, woody matter, insect bodies and other extraneous matter - 8-12; a volatile oil is present in traces.^[40]

The Resin can be fractionated into soft and hard components by exhaustive extraction with ether; the former constitutes 30% of the original resin and is brown in colour. Both soft and hard resins can be further fractionated by successive extraction with organic solvents. One fraction of soft resin contains free acids and neutral materials including the yellow dye, erythrolaccin. The second fraction possibly comprises interesters of equivalent amounts of aleuritic acid, an isomer of aleuritic acid and laccollic lactone.

Antioxidant Activity of *Glycyrrhiza glabra*

Research studies using in vitro models for evaluating antioxidant property of *Glycyrrhiza glabra* Linn aqueous and ethanolic root extracts showed the dose dependent scavenging activity against nitric oxide (concentration that caused 50% inhibition of nitric oxide radicals [IC₅₀]=72 and 62.1 µg/ml, respectively), superoxide (IC₅₀=64.2 and 38.4 µg/ml, respectively), hydroxyl (IC₅₀=81.9 and 63 µg/ml, respectively) radicals. Further, both extracts showed strong reducing power and iron-chelating capacities. In the Fe²⁺/ascorbate system, both extracts were found to inhibit mitochondrial fraction lipid peroxidation.

DISCUSSION AND CONCLUSION

In Ayurvedic classical text Charaka Samhita, 11th chapter named “*Kshat-Kshina chikitsa*” gives the detailed description of primary as well as secondary Pneumothorax (Pneumothorax associated with tuberculosis). *Ksata* literally means injury/ trauma and *Ksata- Kshina* in total means debility due to injury/ trauma. Trauma means external injury and is always due to exogenous cause but in the present context Acharya used this term to signify rupture or burst in the lung tissues due to exogenous as well as endogenous causes. In Ayurveda mainly syndromes are described rather than disease and *Ksata- Kshina* is also a syndrome rather than a disease as suggested by some scholar like phthisis etc. *Ksata- Kshina* and *Rajayakshma* combined to constitute the syndrome of tuberculosis. Hemoptysis (symptom of pulmonary tuberculosis), hematuria (symptom of renal tuberculosis) and diarrhea (symptom of intestinal tuberculosis) all cardinal symptoms of tuberculosis is described as the symptom of *Ksata- Kshina*. *Ksata – Kshina* refers to the disease that appears suddenly and required prompt treatment like acute onset of chest-pain in the patient of tuberculosis who suddenly develops pneumothorax due to rupture of subpleural blebs in pleural cavity or massive painless hematuria in the patient of genitor-urinary tuberculosis. It is apparent that *Kshata Kshina* is a complex immunocompromised syndrome originated either as a trauma or secondary to tuberculosis. Thus for its proper management and for prevention of recurrence due consideration should be given to the immunity. Immunomodulatory as well immune-enhancer drugs should be supplement with hemostatic and adhesive drugs. Hopefully in future clinical studies and extensive experimental studies will scientifically prove the efficacy of herbal management in pneumothorax and materialize the concept of non-invasive treatment.

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