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Clinical evaluation of *Raktadusti* in Hypothyroidism w.s.r. to *Vidhishonitiya Adhyaya* of *Charaka Samhita*

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ABSTRACT

Introduction: *Rakta* is regarded as one of the *Pranayatana* (sit of vitality) and is required to be maintained properly to sustain the life and the homeostatic state of the body. As result of intake of different factors which are responsible for *Raktadusti*, different kind of diseases occur in our body known as *Raktaja Roga*. Hypothyroidism is a pathological condition caused by hypo-functioning of thyroid gland. Hormonal output from thyroid gland is mediated by thyroid stimulating hormone (TSH) secreted by anterior pituitary. In hypothyroidism, there is decreased level of T3 & T4 along with elevated level of TSH in circulating blood. As consequence of *Raktadusti*, the pathological conditions which are mentioned as *Raktaja Roga* by *Acharya Charaka* are combination of independent disease as well as sign and symptoms. Among them many identical features are also found in hypothyroidism. **Aim:** The present study was carried out to evaluate clinical features of *Raktadusti* & *Raktaja Roga* in hypothyroidism along with to evaluate the efficacy of the stipulated *Raktadusti Nashak* therapeutic procedure to combat hypothyroidism. **Materials and Methods:** In selected 35 patients of hypothyroidism having the *Raktadusti Lakshan* based on inclusion and exclusion criteria, selected *Raktadusti Nashak Chikitsa* (combining *Shodhana* and *Shamana* therapy) was administered for 60 days. **Result:** The subjective parameters for *Raktadusti* are clinically present in a maximum number of hypothyroidism patients. The result also reveals the significant efficacy of *Shodhana (Virechana by Trivrit)* and *Shamana (Phalatrikadi Kashayam) Chikitsa* on relevant subjective and objective parameters with a 'p-value <0.001 in majority of subjective and objective parameters. **Conclusion:** The features of *Raktadusti* and *Raktaja Roga* can be clinically verified in patients of hypothyroidism. Thus it can be said that, *Raktadusti* has a definite role to play in pathogenesis of hypothyroidism. *Rakta* should be regarded as one of the main *Dushya* in hypothyroidism. The patients suffering from hypothyroidism can be treated with the therapeutic procedure responsible to combat *Raktadusti*.

Key words: *Rakta*, *Raktadusti*, *Raktaja Roga*, hypothyroidism

INTRODUCTION

Human body is composed of *Dosha, Dhātu and Mala*.^[1] *Agni* is the main factor for digestion, absorption and metabolism.^[2] The root of *Annavaha Srota* (food

channels) is *Amashaya* (stomach) and *Vamaparshva* (omentum).^[3] The food provides nourishment to the tissue elements of body, which are homologous and not contrary in nature.^[4] The ingested food material at first goes through digestion followed by absorption and metabolism with the action of *Jatharagni*, *Bhutagni* and *Dhatvagni* respectively. The pure and waste product of food after digestion and metabolism enter into circulation through the same channel. Each *Dhatu* has its own channel for circulation.^[5] By the virtue of the seven categories of *Agni*, the tissue elements get metabolised in the way of transformation of nourishing materials and transformation of waste products^[6] where the *Kshira-Dadhi-Nyaya* (law of transformation), *Kedari-Kulya-Nyaya* (law of transmission) and *Khale-Kapota-Nyaya* (law of selectivity) are implied.^[7] *Jatharagni* and *Bhutagni* acts at the level of gastro

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intestinal tract, whereas *Dhatwagni* acts at cellular level. *Dhatus* help in the nourishment of body and provides nourishment to the subsequent *Dhatu* where *Upadhatu* only nourish the body.^[8] Among the seven *Dhatus*, *Rakta Dhatu* (blood) or *Shonita* is considered as most important for its broad spectrum effect on wellbeing of human body and also due to the adverse effect on body caused by vitiation of it. *Rakta* is regarded as one of the *Pranayatana*^[9] (sit of vitality) and is required to be maintained properly to sustain the life and the homeostatic state of the body. The importance of *Rakta* can be assumed from the fact that, *Acharya Sushruta* has given it the fourth important place after three *Doshas* - *Vata*, *Pitta* and *Kapha* in relation with *Vrana Chikitsa*.^[10] *Acharya Charaka* has dedicated an entire separate chapter namely - *Vidhishonitiya Adhyaya* (chapter no. 24) in *Charaka Samhita, Sutrasthan*^[11] to describe the various aspect of *Rakta* including - it's normal property, functions, factors responsible for its vitiation, the diseases produced due to its vitiation, management of vitiation of *Rakta* among others. *Rakta* circulates along the human body through multiple macro and micro channels, known as *Raktavaha Srota*, consisting of *Raktavahi Sira* and *Dhamani* (blood vessels) with their root lying in *Yakrit* (liver) and *Pliha* (spleen).^[12]

Concept of Raktadusti (vitiating of blood)

The factors which are responsible for vitiation of blood act through three possible pathways - vitiation of *Dosha* (*Dosha Prakopan*), weakening of *Rakta* (*Dhatu Daurvalya*) and impairment in *Raktavaha Srotas* (*Khavaigunya*).^[13] *Rakta* being the *Dushya* or *Dhatu*, does not possess the ability of self-vitiation by the effect of *Nidan*, rather this vitiation known as *Rakta Dusti* occurs as secondary phenomenon after vitiated *Doshas* afflict *Rakta Dhatu*.^[14] So whenever any person intakes any *Nidan*, it directly causes weakening of *Rakta* and also produces impairment of *Raktavaha Srotas*. When a vitiated *Dosha* afflicts a *Dhatu* this indicates there is some sort of impairment within the *Dhatu*. It is because, in presence of *Vala* (can be compared with *Vyadhikshamatwa* i.e., immunity) which is regulated by *Dhatus*, a disease cannot occur or if it occurs its strength will be much more less.^[15] So,

when there is impairment of *Vala*, a *Dhatu* becomes weaker and it cannot resist itself against the vitiated *Dosha* and gets afflicted by it. This impairment of *Dhatu* or depletion of *Vala* of *Dhatu* should be attributed to various effect of *Nidan*. So, it can be said that *Nidan* causes impairment of *Dhatus* which ultimately becomes susceptible to affliction by vitiated *Doshas*. When a *Dosha* gets vitiated after intake of *Nidan*, it moves through different channels along the body and gets localized where there is an impairment of channel - subsequently afflicts the respective *Dhatu*, the phenomenon known as *Dosha Dushya Sammurchhana*. This phenomenon results into vitiation of channels, known as *Srotadusti* and ultimately vitiation of *Dhatus*, known as *Dhatudusti*. Again, it can be said that, *Dhatudusti* actually means *Dhatukshaya* as in pathogenesis of almost every diseases *Dhatukshaya* occurs.^[16] The whole complex process lays the foundation of genesis of different diseases within body and manifested as different clinical sign and symptoms. That's why, it has been said by *Acharya Charaka* that, the features of *Dhatuvaha Srotadusti* are identical with those diseases which are caused by vitiation of those *Dhatus*.^[17] In terms of *Rakta Dhatu*, *Acharya Charaka* has clearly mentioned in *Vidhishonitiya Adhyaya* that, as result of intake of different factors which are responsible for *Raktadusti*, different kind of diseases occurred in our body known as *Raktaja Roga*.^[18] All *Doshas* in their vitiated state afflict *Rakta Dhatu*, but *Pitta Dosha* has a specific predilection towards *Rakta Dhatu* as *Agneya Guna* lies in common between these two^[19] and also it has been said that, *Pitta Dosha* takes shelter within *Rakta Dhatu* following the hypothesis of "*Ashraya Ashrayee Bhava*" due to similarities in their properties.^[20] So most of the causative factors which are said to be responsible for vitiating *Rakta Dhatu* secondarily, actually primarily vitiates *Pitta Dosha* most. *Acharya Charaka* in *Vidhishonitiya Adhyaya* has mentioned several dietary factors along with regimens which are responsible for *Raktadusti* like : intake of unwholesome, hot and sharp wine and food in large quantity; exceedingly saline, alkaline, acidic and pungent food in large quantity; *Kulattha* (*Dolichos biflorus* Linn.), *Masa* (*Phaseolus radiatus* Linn.), *Nisipava* (a type of *Simbi*), and *Til* oil; *Pindalu* and all

green eatables like radish etc.; meat of aquatic marshy and *Prasaha* type of animal and animal living in holes; curd, sour whey, vinegar, wine, and *Souvirak* type of liquor; rotten or stale food; putrefied food articles and those having mutually contradictory qualities and any other type of food in excessive quantity. Blood also get vitiated by sleeping during after taking liquid, unctuous and heavy food; excessive anger, excessive exposure to sun and fire; suppression of urge of vomiting; absence of bloodletting therapy (in autumn); exertion, external injury, heat, taking food before previous food is digested; by the very nature of autumn season.^[21]

Hypothyroidism is a pathological condition caused by hypo-functioning of thyroid gland. The thyroid gland, which is the largest and one of the most important endocrine gland in human body, is located on the anterior side of the neck, right below the larynx. It has two lobes and is composed of many thin follicular cells with a type of epithelial tissue origin. These follicles store thyroid hormones in the form of thyroglobulin molecules until body requires them. Thyroid gland synthesizes and secretes two major hormones, known as 3,5,3' –triiodothyronine (T3) and thyroxin, which can sometimes be referred to as 3,5,3',5' – tetraiodothyronine (T4). These hormones are necessary for thermo-genic and metabolic homeostasis in adult.^[22] Hormonal output from thyroid gland is mediated by thyroid stimulating hormone (also known as TSH or thyrotropin) secreted by anterior pituitary. The secretion of thyrotropin itself is mediated by thyrotropin releasing hormone (TRH) secreted by hypothalamus. The thyroid axis is a classic example of an endocrine feedback loop. Hypothalamic TRH stimulates pituitary production of TSH, which in turn stimulates thyroid hormone synthesis and secretion. Thyroid hormones, acting predominantly through thyroid hormone receptor beta-2, feedback to inhibit TRH and TSH production. The 'set point' in this axis is established by TSH. TSH plays a pivotal role in control of the thyroid axis and serves as most useful physiologic marker of the thyroid hormone action.^[23] Iodine uptake is the critical first step in thyroid hormone synthesis. The most common disorders of thyroid gland include hyperthyroidism,

hypothyroidism and thyroid nodules, which are generally benign thyroid neoplasm but may change to thyroid cancer.^[24] Iodine deficiency remains the most common cause of hypothyroidism worldwide. In areas of iodine sufficiency, autoimmune disease (Hashimoto's thyroiditis) and iatrogenic causes (treatment of hyperthyroidism) are most common.^[25] Iodine deficiency is responsible for endemic goitre and cretinism but is an uncommon cause of adult hypothyroidism unless the iodine intake is very low or there are complicating factors, such as the consumption of thiocyanates in cassava or selenium deficiency.^[26] Autoimmune hypothyroidism may be associated with a goitre (Hashimoto's, or *goitrous thyroiditis*) or, at the later stages of the disease, minimal residual thyroid tissue (*atrophic thyroiditis*).^[27] The mean annual incidence rate of autoimmune hypothyroidism is up to 4 per 1000 women and 1 per 1000 men.^[28] The mean age at diagnosis is 60 years, and the prevalence of overt hypothyroidism increases with age. Subclinical hypothyroidism is found in 6–8% of women (10% over the age of 60) and 3% of men.^[29]

As consequence of *Raktadusti*, the pathological conditions which are mentioned as *Raktaja Roga* by *Acharya Charaka* are combination of independent disease as well as sign and symptoms. Among them many identical features are also found in hypothyroidism. Studies of these features help us to understand the character of hypothyroidism and its evaluation in the line of *Raktadusti* & *Raktaja Roga*. A comparative study has been given below (Table 1) between the *Raktaja Roga* and the clinical features found in hypothyroidism

Table 1: Comparative study between features of *Raktadusti* and hypothyroidism.^[30]

SN	Clinical Features	<i>Raktadusti</i> Lakshan	Features of hypothyroidism
01.	<i>Mukhapaka</i> (ulcer in mouth)	++	
02.	<i>Akshiraga</i> (redness of eye)	++	

03.	<i>Putighrana Asya Gandhita</i> (foul smell from mouth & nose)	++	
04.	<i>Gulma</i> (tumor)	++	
05.	<i>Upakush</i> (disease of mouth)	++	
06.	<i>Visarpa</i> (rapidly spreading skin disease / dermatitis)	++	++
07.	<i>Raktapitta</i> (bleeding disorders)	++	
08.	<i>Pramilaka</i> (absent mind / state of stupor)	++	++
09.	<i>Vidradhi</i> (abcess)	++	
10.	<i>Raktameha</i> (haematuria)	++	
11.	<i>Pradara</i> (heavy menstrual bleeding)	++	++
12.	<i>Vatashonita</i> (gouty arthritis)	++	
13.	<i>Vaivarnya</i> (pallor)	++	++
14.	<i>Agnisada</i> (diminution of digestive power)	++	++
15.	<i>Pipasa</i> (thirst)	++	
16.	<i>Gurugatrata</i> (heaviness of body)	++	++
17.	<i>Santap</i> (rise of temperature)	++	
18.	<i>Ati Daurvalya</i> (excessive weakness)	++	++
19.	<i>Aruchi</i> (anorexia)	++	++
20.	<i>Shira Ruja</i> (headache)	++	
21.	<i>Vidaha Annapanascha</i> (burning sensation after intake of food)	++	

22.	<i>Tikta Amla Udgiran</i> (sour and bitter eructation)	++	
23.	<i>Klama</i> (feeling of tiredness)	++	++
24.	<i>Krodha Prachurata</i> (irritability)	++	++
25.	<i>Buddhi Sammoha</i> (impairment of intellectuality)	++	++
26.	<i>Lavana Asyata</i> (salt taste in mouth)	++	
27.	<i>Sweda</i> (excessive sweating)	++	
28.	<i>Sharira Dourgandhya</i> (bad body odour)	++	
29.	<i>Mada</i> (intoxication)	++	
30.	<i>Kampa</i> (tremor)	++	++
31.	<i>Swarakshaya</i> (hoarseness of voice)	++	++
32.	<i>Tandra</i> (drowsiness)	++	++
33.	<i>Nidra Atiyog</i> (excessive sleeping)	++	++
34.	<i>Tama Darshan</i> (blackout)	++	
35.	<i>Kandu</i> (itching)	++	++
36.	<i>Kotha, Pidaka</i> (urticaria)	++	++
37.	<i>Kustha</i> (skin disease / dermatitis)	++	++
38.	<i>Charmadala</i> (skin disease)	++	

In the above context, the present study was carried out keeping the following aims and objectives

1. Evaluation of the concept of *Raktadusti* and its clinical diagnosis

2. Evaluation of *Raktadusti* in hypothyroidism
3. Assessment of efficacy of the stipulated therapeutic procedure (*Virechana* by *Trivrit Churna* along with *Shamana* by *Phalatrikadi Kashayam*) as *Raktadustihara Chikitsa* in management of hypothyroidism.

MATERIALS AND METHODS

The literary information regarding the similarities between *Raktadusti Lakshan* and features of hypothyroidism has been verified through clinical study. Assessment of homologous features of *Raktadusti* and hypothyroidism were done on the basis of subjective and objective criteria. The study has been also carried out to evaluate the efficacy of stipulated therapeutic procedure (*Virechana* by *Trivrit Churna* along with *Shamana* by *Phalatrikadi Kashayam*) as *Raktadustihara Chikitsa* in the management of hypothyroidism. The subjective and objective criteria have been evaluated before and after treatment for assessment of the efficacy of administered therapy.

Selection of Patients

35 patients were selected from OPD of Institute of Post Graduate Ayurvedic Education & Research, at *Shyamadas Vaidya Sastra* Pith hospital, Kolkata -9, irrespective of their sex, occupation and religion. The patients having low serum thyroid hormone level (T3 & T4) with raised serum TSH level were selected for the study and subsequently the features of *Raktadusti* were evaluated on the basis of subjective and objective parameters. Prior to carry out the study the informed patient consent form was duly signed by the patients.

Inclusion Criteria

1. Patients above 20 years of age and below 60 years of age, irrespective of their occupation, sex and religion.
2. Patients who are willing to include themselves into the study.
3. Patients having the serum TSH level > 4.25 μ IU/mL
4. Patients having the serum T3 level < 77 ng/dL & serum T4 level < 5.4 μ g/dL

5. Primarily detected hypothyroidism patient, not taking any type of medication.
6. Primarily detected hypothyroidism patient without any other chronic and acute disease.

Exclusion Criteria

1. Patients below 20 years of age and above 60 years of age, irrespective of their occupation, sex and religion.
2. Patients who are not willing to include themselves into the study.
3. Patients having the serum TSH level less than 4.25 μ IU/mL
4. Patients having the serum T3 level greater than 77 ng/dL & serum T4 level greater than 5.4 μ g/dL
5. Primarily detected hypothyroidism patient, taking thyroxin medication.
6. Primarily detected hypothyroidism patient with any other chronic and systemic disease.

Subjective Parameters

Subjective parameters were selected on the basis of identical features between *Raktadusti* and hypothyroidism:

1. *Vaivarnya* (pallor)
2. *Agnisada* (diminution of digestive power)
3. *Gurugatrata* (heaviness of body)
4. *Daurvalya* (weakness)
5. *Aruchi* (anorexia)
6. *Krodha Prachurata* (irritability)
7. *Pradara* (heavy menstrual bleeding)
8. *Buddhi Sammoha* (impairment of concentration)
9. *Tandra* (drowsiness)
10. *Kustha* (dermatitis)

Objective Parameters

1. Estimation of serum TSH level
2. Estimation of serum T3 level

3. Estimation of serum T4 level

Adoption of Therapeutic Procedure

Virechana (therapeutic purgation) is a type of *Samshodhan Chikitsa* (bio purification therapy) which is indicated in all types of *Raktadusti* and *Raktaja Roga* as per *Vidhishonitiya Adhyaya of Charaka Samhita*.^[31] Similarly *Phalatrikadi Kashayam* is a well-known drug indicated as *Shaman Chikitsa* (pacifying management) in the management of *Pandu & Kamala*.^[32] As both the disease arise due to vitiation of *Rakta Dhatu* mainly, so it has been considered to be effective in all types of *Raktadusti* along with *Raktaja Roga*. The stipulated drug has been prepared as per formulation given in *Sharangadhar Samhita*^[33] in the apothecary department of the study conducting institution. The above two therapy has been administered as: 1. *Virechana Karma* by root powder of *Trivrit (Operculina turpethum)* - 3 gm with warm water after food at bed time (night), along with 2. *Phalatrikadi Kashayam* - 50 ml with honey before lunch and dinner. Each of the therapy has been continued simultaneously for consecutive 60 days. After 60 days the effect of the stipulated therapeutic regimen has been evaluated.

Study Protocol

Duration of Study

The duration of the study was 60 days.

Assessment Criteria

Assessment has been done on the basis of subjective and objective criteria before and after treatment. For the statistical evaluation each of the subjective parameters has been arranged as per gradation.

Follow up of Patients

All the patients were reviewed after 60 days from the date of administration of first dose. Any special information regarding the general health of the patient was recorded accordingly.

Study Sample

Total 35 patients of hypothyroidism with features of *Pandu Roga* were included in the study.

Statistical Analysis

The information gathered on the basis of observation made about various parameters has been subjected to statistical analysis in terms of Mean, Standard Deviation (SD) and Standard Error (SE). Paired 't' test was carried out at $P < 0.05$ and $P < 0.001$. The obtained results were interpreted as $-P < 0.05$ is significant & $P < 0.001$ is highly significant.

OBSERVATIONS AND RESULTS

Among the 35 patients total 5 patients were dropped out during study course. Hence complete clinical survey was done in 30 patients. Distribution of subjective parameters of *Raktadusti* among the 30 patients of hypothyroidism shows that, *Vaivarnya* (pallor) present in 18 patients, *Agnisada* (diminution of digestive power) presents in 30 patients, *Gurugatrata* (heaviness of body) present in 26 patients, *Daurvalya* (weakness) present in 29 patients, *Aruchi* (anorexia) present in 29 patients, *Krodha Prachurata* (irritability) present in 21 patients, *Pradara* (heavy menstrual bleeding) present in 21 patients out of 24 female patient, *Buddhi Sammoha* (impairment of concentration) present in 25 patient, *Tandra* (drowsiness) present in 28 patients & *Kustha* (dermatitis) present in 16 patients [Table no. 2]. Statistical analysis of subjective and objective parameters in 30 patients of hypothyroidism before and after 60 days of treatment shows that *Shodhan* therapy in terms of *Virechan* and *Shaman* therapy in terms of *Phalatrikadi Kashayam* have significant efficacy on both the subjective and objective parameters with 'p' value < 0.001 in most of the parameters after 60 days. [Table no. 2].

Table 2: Distribution of subjective parameters of Raktadusti among the 30 patients of hypothyroidism:

SN	Subjective Parameters	No. of patients	Percentage
01.	<i>Vaivarnya</i> (pallor)	18	60%
02.	<i>Agnisada</i> (diminution of digestive power)	30	100%

03.	<i>Gurugatrata</i> (heaviness of body)	26	87%
04.	<i>Daurvalya</i> (weakness)	29	96.67%
05.	<i>Aruchi</i> (anorexia)	29	96.67%
06.	<i>Krodha Prachurata</i> (irritability)	21	70%
07.	<i>Buddhi Sammoha</i> (impairment of concentration)	25	83.33%
08.	<i>Tandra</i> (drowsiness)	28	93.33%
09.	<i>Kustha</i> (dermatitis)	16	53.33%
10.	<i>Pradara</i> (heavy menstrual bleeding)	21 (out of 24 female patient)	87.5%

Table 3: Statistical analysis of subjective and objective parameters in 30 patients of hypothyroidism before and after 60 days of treatment:

Parameters	Mean BT	Mean AT	SD+/-	SE+/-	't' value	'p' value
<i>Vaivarnya</i>	2.77	2.23	0.98	0.18	3.0	<0.05
<i>Agnisada</i>	3.23	1.13	2.31	0.42	4.98	<0.001
<i>Gurugatrata</i>	3.0	1.36	2.01	0.37	4.59	<0.001
<i>Daurvalya</i>	2.24	1.4	1.19	0.22	3.87	<0.001
<i>Aruchi</i>	3.16	1.10	2.23	0.41	5.024	<0.001
<i>Krodha Prachurata</i>	2.16	0.87	1.53	0.28	4.64	<0.001
<i>Buddhi Sammoha</i>	1.33	0.97	0.79	0.14	2.57	<0.05
<i>Tandra</i>	2.8	1.3	1.88	0.34	4.39	<0.001

<i>Kustha</i>	2.27	0.87	1.64	0.30	4.66	<0.001
<i>Pradara</i>	3.10	1.10	2.22	0.41	4.88	<0.001
Serum TSH	8.13	4.85	4.05	0.74	4.45	<0.001
Serum T3	67.86	76.86	8.47	2.26	3.98	<0.01
Serum T4	2.63	5.70	3.584	0.654	4.794	<0.001

DISCUSSION

With the progression of each era, there are emergence of new diseases and various pathological conditions. As *Acharya Charaka* has famously said, not every disease or a pathological condition can be given a stipulated name,^[34] so each of the newly emerged pathological condition which has not been clearly defined in our ancient texts previously, should be analysed on the basis of involvement of *Dosha*, *Dushya* etc. Hypothyroidism is such a pathological condition which has not been explicitly described in our classical compendiums. This pathological condition should be studied in the line of *Dosha*, *Dushya*, *Srotas*, *Agni* etc. as described in our compendiums. Hypothyroidism is primarily a metabolic disorder where there is less synthesis of thyroid hormones. According to *Ayurvedic* philosophy, all the metabolic functions are regulated by *Dhatwagni*.^[35] Thus, diminished synthesis of thyroid hormones can be attributed to hypo function of *Dhatwagni*. *Dhatwagni* helps to regulate *Dhatwagnipaka* (identical to metabolism) where there is production of *Rakta Dhatu* from *Rasa Dhatu* and with the help of *Raktagni*, further the *Poshak* part of *Rakta Dhatu* transforms in to *Mamsa Dhatu* (as per *Kshira Dadhi Nyaya*).^[36] By this process there is production of *Rakta Oja* which helps to maintain the normal strength of *Rakta*.^[37] So, whenever there is impairment of *Dhatwagni*, there is impairment of *Dhatu Paka*, as result of this there is less production of *Rakta Dhatu* as well as *Rakta Oja*. The diminution of *Rakta Oja* makes *Rakta Dhatu* vulnerable and it becomes susceptible to vitiated *Doshas* which ultimately leads to *Raktadusti*.

From this point of view, it can be said that *Raktadusti* is an inevitable phenomenon in case of hypothyroidism.

Iodine deficiency remains the most common cause of hypothyroidism worldwide.^[38] Iodide uptake by thyroid gland cells is a critical first step for thyroid hormone synthesis. Thyroid gland extracts iodine from the circulation in a highly efficient manner.^[39] Deficiency of iodine as a part of diet will lead to hypothyroidism. Where there is no deficiency of iodine, autoimmune disease (Hashimoto thyroiditis) is the most common cause of hypothyroidism. In Hashimoto's thyroiditis, there is a marked lymphocytic infiltration of the thyroid with germinal centre formation, atrophy of the thyroid follicles accompanied by oxyphil metaplasia, absence of colloid, and mild to moderate fibrosis.^[40] In both the cases, there is decreased level of T3 & T4 in circulating blood. *Raktadusti* should be compared with *Rakta Dhatu Kshaya* as described earlier. The term *Dhatu Kshaya* can be interpreted as *Dravyata Kshaya* (loss of whole tissue element), *Gunata Kshaya* (diminished component of tissue element) and *Karmata Kshaya* (diminished function of tissue element) in accordance with concept of *Samanya Visesh*.^[41] Here decreased level of T3 & T4 in circulating blood can be interpreted as *Gunata Rakta Kshaya*. It can be hypothetically said that, in case of Hashimoto thyroiditis, autoimmune inflammatory reaction is induced by vitiation of *Pitta Dosha*, mainly due to vitiation of *Ushna*, *Tikshna* and *Katu Guna* of *Pitta*.^[42] Lymphocytic infiltration can be compared with vitiation of *Rakta Dhatu*. Atrophy of the thyroid follicles can be termed as consequence of obstruction of *Raktvaha Srotas* – the chief source of cellular nutrition as described in compendium.^[43] Table 2 shows that, most of the cases included under the present study were satisfying all the subjective criteria, which are identical features between *Raktadusti* and hypothyroidism. It signifies that, the textual understanding regarding *Raktadusti Lakshan* and features of hypothyroidism can be validated clinically.

Statistical analysis of various subjective and objective parameters of 30 patients, before and after 60 days of treatment in Table 3 shows the 'p' value <0.001 in most

of the parameters, which indicates that, the therapeutic procedure is significantly efficacious in the management of hypothyroidism after 60 days. *Virechan* by *Trivrit Churna* eliminates vitiated *Pitta Dosha* as well as it is helpful in the management of vitiation of *Rakta Dhatu*.^[44] *Phalatrikadi Kashayam* is a compound drug which is very effective in the management of *Raktadusti*. This drug consist *Amlaki*, *Haritaki*, *Vibhitaki*, *Guduchi*, *Katuki*, *Nimba*, *Chirayata* and *Vasa*. Majority of the ingredients have *Pittanashak* as well as *Rakta Shodhak* property, thus are very effective in *Raktadusti*.^[45] Thus combination of the above two therapeutic procedure is significantly effective against *Raktadusti* as well as hypothyroidism.

CONCLUSION

In absence of categorical description of hypothyroidism in ancient *Ayurvedic* texts, this pathological condition should be studied in accordance with involved *Dosha* and *Dushya*. The features of *Raktadusti* and *Raktaja Roga* can be clinically verified in patients of hypothyroidism. Thus, it can be said that, *Raktadusti* has a definite role to play in pathogenesis of hypothyroidism. *Rakta* should be regarded as one of the main *Dushya* in hypothyroidism. Management of *Raktadusti* as described in our ancient compendiums in form of *Shodhan Chikitsa (Virechan)* and *Shaman Chikitsa (Phalatrikadi Kashayam)* are very effective to combat hypothyroidism. Thus, the patients suffering from hypothyroidism can be treated with the therapeutic procedure responsible to combat *Raktadusti*.

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