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REVIEW OF THE CONCEPT OF YAKRUTOTPATTI (EMBRYOLOGY OF LIVER)

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ABSTRACT

Science is the result of the curiosity of human being through which human being has studied, analyzed and come to the results of various natural processes occurring in the body. Today practically and scientifically the existence of everything has been proved. *Ayurveda*, being a part of this science also needs a deep study and research for proving all the facts established by Acharyas in ancient times. The liver is a vital organ for metabolism. Acharyas have opined about the genesis of *Yakrut* (liver) from *Rakta Dhatu* (blood tissue). Parallel opinion in modern anatomy states that an abundant quantity of blood is responsible for the formation of sinusoids of the liver. This huge quantity of blood comes from broken vitelline and umbilical veins in the septum transversum. On the other hand, the raw material for the formation of blood cells and liver (septum transversum) is the same, being mesenchymal cells from the mesoderm. The present review was conducted to discover the similarities about the genesis of the liver in the opinions of ancient and modern medical science. This may be useful for utilizing ancient medical science from a new perspective. Therefore, it is attempted to correlate the genesis of the liver in Ayurveda with modern science.

Keywords: *Yakrut, embryology, rakta, dhatu, liver, Rachana*

INTRODUCTION

According to modern science, the visceral organs can be studied with two perspectives, viz. anatomical observations and physio-pathological derangements. Ayurveda Samhitas concise the study under one heading of *"Sharir*". The subject covers the anatomical as well as physiological studies related to the specific organ.

Ayurveda narrates the basic principles including *Panchamahabhoota*, *Tridosha*, *Saptadhatu*, etc., given embryology and organogenesis. The various organs generate from different combinations of these *Bhavapadarthas*. The liver is a vital organ for metabolism. Acharyas have opined about the genesis of *Yakrut* from Rakta Dhatu (blood tissue). A parallel opinion in conventional anatomy states that an abundant quantity of blood is responsible for the formation of sinusoids of the liver. This huge quantity of blood comes from broken viteline and umbilical veins in the septum transversum. On the other hand, the raw material for the formation of blood cells and liver (septum transversum) is the same, being mesenchymal cells from the mesoderm. It is essential to conceptualize the basic genesis of the liver to form the exact pathogenesis and treatment in Ayurveda. The present research is carried out to understand this concept in the light of contemporary science. This may be helpful while treating the disorders of the liver.

AIM OF THE STUDY

This study has been conducted to assess the views of Ayurveda and contemporary science based on the genesis of the liver.

MATERIALS AND METHODS

Different Ayurveda Classical textbooks Charaka Samhita with Sanskrit Commentary of Chakrapani and Hindi Commentary of different Ayurveda scholar, Sushruta Samhita with Sanskrit commentary of Dalhana and Hindi commentary of different Ayurveda scholars like Prof. Ambika Datta Shastri Kashyapa Samhita, Hindi and English commentary, different Ayurveda journal articles, different textbooks of embryology (Prof. IB Singh, Vishram Singh, Langman's embryology etc.), different textbooks of Anatomy like BD Chaurasia Human Anatomy, Gray's Anatomy and different evidence-based research articles with the keyword searches with Anatomy, embryology, Organogenesis etc.

REVIEW OF LITERATURE

***Paryaya* (Synonyms)**

Synonyms like *Kalakhanda, Jyotisthana,Yakrutkhanda,Yakrutpinda, Raktadhara and Raktashaya* are found in the ancient literature.

***Kalakhand*:** This word is also used as a synonym of *Yakrut* in the Sushruta Samhita.

Jyotisthana: *Jyoti* means *Agni*. The site of *Agni* is called the *Jyotisthana*.

Fetal nutrition usually depends on *Ahara Rasa*, categorized under maternal factors and *Vayu* present in *Jyotisthana* and responsible for cell division. The *Ahara Rasa* is first received by *Jyotisthana*, which further nourishes the whole body. Therefore, *Jyotisthana* means "liver".

Yakrutkhanda: In *Ashtanga Hrudaya, Acharya Vagbhata* has used this word with regards to the description of diseases. In modern science, *Yakrutkhanda* means lobes of the liver.

Raktadhara/Raktashaya: *Yakrut* is a site of *Rakta Dhatu.* Blood is stored in the liver; therefore, *Raktadhara or Raktashaya* words have been used in Sushrut Samhitas.

Varna (Color)

In the classics, various references regarding the colour of *Yakrut* can be seen during the elucidation of signs and symptoms of diseases. The colour of *Vidradhi* is similar to the colour of *Yakrut, i.e., Krushnalohitam* (reddish-brown).

Acharya Vagbhata has compared the colour of *Arsha* with *Shukajihva*, i.e., the tongue of parrot, *Pittaja Yakrutkhanda* and *Jalouka.* In *Sharira Sthana*, he has stated the critical condition of the patient in *Atisara* (diarrhoea). - "If the colour of stool is like the *Yakrutpinda* or *Mansadhavana*, the patient will not survive".

***Svarupa* (Appearance)**

According to *Bruhadarunyaka Upanishad*, the appearance of *Yakrut and Pleeha* are solid structures like mountains.

***Sthana* (Site)**

The site of the liver is below and right to the heart. Acharya *Arundatta* has given the same statement.

***Karya* (Physiology of liver)**

Many Acharyas have stated that the main function of *Yakrut* is to offer red colour to *Rasa Dhatu*, i.e., *Ranjana of Rasa Dhatu*. However, according to Acharya Vagbhata, this function is carried out by *Amashaya*, i.e., the stomach. According to Sushruta, the function of *Pitta*, which has its seats in the liver and spleen, consists of imparting its characteristic pigment *(Ragakrut)* to the *Rasa Dhatu* (lymph chyle) and hence it is known as *Ranjakagni*. *Acharya Sharangadhara* also has a similar opinion about the formation of blood.

Utpatti

About the development of body parts, *Yakrut* is developed or generated from *Matrujabhava*, as stated by Acharya Sushruta and Charaka in *Sharira Sthana*.

Acharya Sushruta in *Sharirsthan* states that *Yakrut* is also engendered by *Rakta Dhatu.* According to Acharya Arundatta, the three *Bhavapadarthas*, i.e., *Samana Vayu*, *Dehoshma*, and *Rakta Dhatu* take part in the formation of *Yakrut*, *Pleeha*, and *Kloma*. While considering these verses, it has been clear that all the Acharyas were sure about the major role of *Rakta Dhatu* in the development of *Yakrut* (liver).

DISCUSSION

Ayurveda described the formation of the body in the *Sharira Sthana* in *Garbha Avakranti Sharira. Garbha Sharira (Garbha Masanumasika Vikasa) Avakranti* means stepwise development. As the body formed or developed in a stepwise manner the term *Avakranti* has been used.

According to Ayurveda Samhitas, the liver develops from *Rakta Dhatu.* The correlation of this in modern science is:

The development of the liver is from the hepatic bud and septum transversum that is the unsplit part of the mesoderm.

On the first hand, the mesoderm produces septum transversum and the liver develops from the same. On the other hand, the mesoderm also produces mesenchymal cells, which in turn produce myoblast, chondroblast, lymphoblast, hemocytoblast, etc. The blood cells develop from hemocytoblast and lymphoblast. Last but not the least, it is seen that the raw material for liver and blood is the same, i.e., mesoderm.

Secondarily, the septum transversum is the first site of maternal blood. The umbilical and viteline veins open at the septum transversum; due to this, the septum transversum is rich in blood supply. The hepatic bud grows in the septum transversum and, due to it, the umbilical and vitelline veins are broken up forming the liver sinusoids. It indicates that blood plays an important role in the development of the liver. Hence, in this manner, the references in Ayurveda can be correlated with modern science regarding the development of *Yakrut.*

According to Ayurveda, the Rasa Dhatu, which comes to Yakrut and Pleeha, get coloured by Ranjakagni. But this is too difficult to correlate with modern science. In the term of modern science, it can be matched with haematopoiesis. Haematopoiesis is carried out by Yakrut only in intrauterine life. However, after birth, this is carried out by red bone marrow. In some pathological conditions, the liver may help in forming blood cells with red bone marrow. The function of *Yakrut* is the metabolism of fats, proteins, etc., or storage of certain vitamins, nutrients or glycogen and not colouring the chyle. On the whole, the term of *Ranjakagni* related to the liver is too difficult to match with any of the components present in the liver.

The above discussion shows that the embryological origin of the liver is blood tissue as per Ayurveda as well as modern science. Hence, in case of any liver disorder, the baseline treatment for blood disorders may be adopted. However, the study opens a new window on the applicability of this concept in the

management of hepatic disorders. The efficacy of drugs acting on *Raktavahasrotasa*, like *Sariva, Manjishtha, Triphala,* etc., needs to be evaluated from the perspective of hepatic disorders.

CONCLUSION

Except for the method of presentation, no differentiation is being identified in the development of the liver in both Ayurvedic as well as modern perspectives. Given the above facts, it is clear that Ayurvedic classics have a fabulous scientific approach in understanding the fundamentals in general and *Rachana Sharira* in particular.

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