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A Review Study of Organogenesis According To Ayurvedic and Modern Perspective

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ABSTRACT:
Ayurveda, the science of life and a system of ancient medicine, defines health and various disorders, as well as their treatment, in great detail. Acharya explains the human body under the notion of Sharira before describing ailments and their treatments. The Anga, Pratyanga, Indriya, and Avyava make up Sharira.Embryology is the study of a person's development prior to birth.Although microbiology, molecular biology, and genetics were not discovered in ancient times, distinct thoughts about them may be found in Vedic scriptures, Puranas, and Samhita Granthas.Garbha Avakrantior Garbha Masanumasika Vikasa, is how Acharya describes Garbha's origin. The word Vikasa refers to sequential progress.Organogenesis occurs in the first trimester, according to contemporary embryological organ development. Organogenesis is based on the trigeminal layers (Ectoderm, Mesoderm, and Endoderm) and so different organs develop with varied proportions and components of the germ layers' cells. When the Avayava Utpatti Siddhanta is compared to the trigeminal layer hypothesis of modern embryological organogenesis, the similarities in organ development discussed in Ayurveda and modern embryology become clear. Avayava Utpatti in Ayurveda is based on Dosha, Dhatu, and Mala, same as germ layers in embryology are based on organogenesis.In this study, references on embryology, foetal growth and development are collectedthrough literature review. Various references show that these branches improved at the time, including fertilization, cell division, foetal nutrition and organogenesis with monthly foetal development. Some of this has been verified through recent study.

KEYWORDS: Ayurveda,Avyava utpatti, Human Embryology, Garbhavakranti.

I. INTRODUCTION:

Ayurveda, the ancient and natural system of medicine, gives the definition of life as the union ofSharira, Indriya, Satva and Atma. Sharira refers to the physical body that is made up of the three main pillars are Dosha, Dhatu, and Mala. Dosha refers to the humour, that governs the different functions of body with multidisciplinary and inter-coordination. Dhatu are the structure that gives the body its form and exterior phonotypical look. Dhatu are primarily crucial for a person's nutrition, health, and longevity. Dhatu are responsible for the body's anatomical architecture at its most fundamental level. Mala are mostly created by several biological processes that occur during an individual's daily biophysical activity. Among all of these, Dhatu is primarily responsible for the creation of an individual's organs. In Ayurveda, all organs develop during embryological life and are explained in great detail as Garbha Avakranti Sharira. Garbha Avakranti refers to the growth of the Garbha in Garbhavastha. All Ayurveda Acharya in Sharira Sthana of Ayurveda describe Garbha Avakrantiof their classical texts, respectively. The Garbha Avakranti is defined by Acharya Sushrut as the Garbha and Garbhini Vyakarana Sharira. Sushrut defines the development of all the organs in Sharira Sthana from various dhatu and dosha. Avayava Utpatti is the name given to this technique.The discipline of medicine known as embryology studies the formation of the human embryo and its development inside the uterus until the delivery of a child.

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Modern embryology describes the genesis of the embryo at the molecular and genetic level in great detail. Organogenesis, which occurs during the first trimester of pregnancy, is a concept in modern embryology that allows one to see the formation of many organs in the embryo. In the first four months of pregnancy, Acharya Sushrut also explained the Avayava Utpatti. Modern organogenesis bears striking similarities to the Ayurvedic Avayava Utpatti. Despite the fact that current embryology provides a highly complete and meticulous description of embryogenesis, the Ayurveda Garbha Sharira does as well.The study of the formation of the human embryo and its development inside the uterus until the birth of a foetus is known as embryology.Ayurveda is an ancient Indian system of medicine. When compared to modern embryology, Garbha Shariralikewise depicts Garbha in an equally scientific manner. This article aims to illustrate the significance of Avayava Utpatti Siddhant, as mentioned in Sushrut Samhita, and to establish its correlation with modern embryology, as well as the critical role of Ayurveda in comprehending modern embryology.

AIM:

To correlate the Ayurveda concept of Avyava Utpatti with modern aspect of organogenesis.

II. LITERATURE REVIEW:

Ayurveda described the formation of body in the Sharira Sthana in Garbha Avakranti Sharira. Garbha Avakranti means the stepwise development of Garbha Masanumasika Vikasa[1,2,3,4]. As body formed or developed in stepwise manner, the term Avakranti has been used. Very first there is development of the six buds or called as the Shadanga. Shadanga includes the two upper limbs, two lower limbs, trunk and the head. Trunk mainly contains the Ura and Udara means the chest and abdominal cavity. Chest as well as abdominal cavities contains the different organs inside. These all organs together are called as the Koshthanga in Sushruta Samhita. Koshthanga are the internal organs and also called as the Avyava. There are few fundamental concepts have been mentioned in Ayurveda regarding the organogenesis (Avyava Utpatti). All organs are developed simultaneously inside the embryo at the same time. The growth and development of different organs has been takes place in further months of pregnancy. All Acharya defines the formation of different Anga, Pratayanga, Avayava, Indriya simultaneously in third month of Garbha Vikasa Krama. These all Anga, Pratyamga, Avayava and Indriya shows their existence in (Sukshma Roopa) microscopic form in very tiny Garbha. And the further development of all these Anga, Pratyanga, Avyava and Indriya takes place in sequential manner, and that sequential development of Avayava is explained with word Yathakramam in Kashyapa Samhita. Third month onward the Avayava are start to developed and start to takes a definite shape define with the word Pravykto Bhavati in Sushruta Samhita. Avyava Vikasa (Organ development) is continued till Seventh month of Garbha Vikasa Krama and complete growth of that Avayava is defined with word Pravyktataro Bhavati, and by this time pf seventh month of Garbha Vikasa Krama all these organs attained the functional optimum capacity to perform their normal physiological functions independently after birth of baby and this is explained in Kashypa Samhita as Sarva Dahtu Anga Sampoorna Garbha.[5]

Though all major and minor parts are present in the young immature foetus they are not recognisable because of their minuteless, they only become clearly recognisable with the passage of time.

(Su. Sha.3/32)

1) 1st month: Embryo turns into Kalala (random or irregular form)(Su. Sha 3/18,A.S Sha. 2/13,A.H.Sha.1/37)Harita explained the 1st month development in a very elobrating way.(HA.Sha.1/7). it becomes Kalala on the first day of the first month, according to contemporary science: formation of morula.

- Up until the tenth day, it is Budbuda (Blastocyst formation begins around the 5th day).
- Up to the 15th day, it is Ghana (solid).
- Up to the 20th day - It transforms into a mass of flesh (Mamsa Pinda).
- From the 25th day onwards, it is known as Panchamahabhutatmaka (we can explain it as already present from fertilization, gets activated for organogenesis).

2) 2nd month: At this period, the child's gender can be anticipated. If the solid mass is oval (Pinda), the infant will be male, elongated (Peshi) will be female, and circular (Arbudakara) mass will be hermaphrodite. According to Sushruta, accumulated Mahabhutas are processed by a combination of Shleshma, Pitta, and Vayu (Tridosha) and solidify.(Ch.Chandrika Sha.4/10,A.T.Sandipika 3/18,A.S Sha.2/13, A.H.Sha1)

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- According to Harita, the budlike structure of future body parts is produced up to the 50th day (Garbhankura).(HA.Sha.१/१९)

3) 3rd month: All body parts and Indriyas become visible in the third month. Five buds have developed: one for the head, four for the upper and lower extremities.(Ch.Chandrika Sha.4/1,A.T.Sandipika3/8, A.H.Sha1/54)

- As Kashyapa mentioned, the embryo begins to move (Praspandana), develops consciousness, and is able to sense pain.Chakrapani mentions the development of body hairs this month.
- Organs in the arms and legs develop up until the end of the second month and on the third month, according to modern research. The foetus can make spontaneous movements, however they are normally too feeble to be detected by the mother.Kashyapa may have mentioned this apparent movement.

4) 4th month: The formation of numerous bodily components is complete until the fourth month, when the foetus becomes stable.

- Sushruta and Bhavamishra both discuss the beating of the heart and the consciousness associated with it. The presence of flavour and food that the mother requests might affect the character and behaviour of the childaccording to Harita. Lanugo appears around the fourth month.
- According to modern research, heartbeats begin in the second month, are detectable using Doppler in the third month, and by stethoscope in the fourth month. Heartbeats are referenced directly on the fourth month in Ayurveda Granthaas, and lanugo development is described in the fourth month by modern and Harita as well.

5) 5th month: The mind develops, resulting in an increase in mental awareness. The foetus gets more 'Sujiva' (viable), according to Harita.(Ch.Chandrika Sha.4/21,A.T.Sandipika3/19,A.S Sha2/23)

According to recent research, auditory and peripheral sensory reflexes develop to a considerable amount by the fifth month, and hence authors have referenced the enlightenment of 'mana.'

6) 6th month:In the sixth month, Aacharyas discuss 'Buddhi' enlightenment.(Ch.Chandrika Sha.4/23,A.T.Sandipika3/30)

This month is associated with the growth of hairs, nails, bones, tendons, and the buildup of energy as well as the appearance of the skin. (A.S Sha2/30,A.H.Sha.1/57)

- Prasphurana — Spontaneous foetal movements was mentioned by Harita.
- Up to the 24th or 25th week, the sensory and motor neuron systems have matured and grown to the point that a description of 'buddhi' enlightenment may be described.
- Hair forms on the eyebrows and eyelashes, as well as hairs on the scalp, until the sixth month. Lanugo covers the full body.

7) 7 th month:In the seventh month, all of the characteristics, bodily components, and organs are fully developed. (Ch.Chandrika Sha.4/23,A.T.Sandipika3/30,A.S Sha2/25, A.HSha.1/58)

- According to modern research, foetal viability is determined by the 28th week, and if a baby is born in the seventh month, the lungs have matured enough for the baby to survive.

8) 8 th month: This month, all Aacharya have mentioned the instability of 'Oja.' This month, it shifts from mother to foetus and back to mother. If Oja remains in the mother's body instead of the unborn at the moment of delivery, the foetus will die.(Ch.Chandrika Sha.4/24,A.T.Sandipika3/30,A.S Sha2/26, A.H.Sha.1/59)

This idea of 'Oja' metamorphosis is difficult to explain by current science, but it is recognised that babies delivered in the eighth month have a higher risk of stillbirth than babies delivered in the seventh and ninth months, for reasons that modern science cannot explain.

- According to Harita, the Pachakagni (digestive system) begins to function in the eighth month.

Of a nutshell, the milestones in the Avayava Vikasa in Garbha are as follows:

From Ayurveda Garbha Avakranti– 3rd Month to 7th Month - Crucial

- 3rd Month – Simultaneously spurted in cohort – Sukshma Bhavati[6]
- 4th Month – Pravykto Bhavati[7]– Visible development but in progress

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Sr.No.	First Formed Body Part	*Samhitas* Mentioning The firstly formed Organ		
		Charaka Samhita	*Sushruta Samhita* and *Bhavmishra*	*Bhela*
1.	*Shira* (Head)	*Kaumarashira Bharadwaja*	*Shaunak*	*Bharadwaja*
2.	*Hridaya* (Heart)	*Kankayana*	*Krutavirya*	*Parashara*
3.	*Nabhi* (Umbilicus)	*Bhadrakapya*	-	*Khandkapya*
4.	*Pakwashaya, Guda* (Duodenum and anus)	*Bhadrashaunaka*	-	*Shaunak*
5.	Hasta,pada (Extrimities)	*Badish*	*Markandeya*	*Badish*
6.	*Indriyas* (sense organs)	*Vaideha Janaka*		
7.	*Madhya Sharira* (Trunk)	-		*Subhuti Gautam*
8.	*Akshi* (Eyes)	-	-	*Kashyapa*
9.	All body parts together	*Dhanwantari and Aatreya Punarwasu*	*Dhanwantari*	*Aatreya Punarvasu*

• 5th – 6th Month – Grows continuously
• 7th Month – Pravykta taro Bhavati[8]– Optimum growth and development of Organs –Viable foetus
The foetus's first body portion develops: There is some debate in Granthasabout this. Below are some of the different viewpoints that have been expressed throughout disputes[9,10]

Because organogenesis occurs at various phases of embryonic life up to the ninth month, Dhanwantari&Aatreya Punarvasu believe that all body parts grow at the same time. Their's this beilief is more accurate.

Constituents of different body Parts: (A.T.Sandipika4/26-31,A.S. Sha.5/48-58)

Organs	Origin from
Yakrut and Pleeha (liver and spleen)	Rakta Dhatu
Phupphus (lungs)	Rakta Fena
Unduk (Caecum)	Rakta Kitta
AAantra (Intestine),Guda(anus) and Basti (urinary bladder)	Sara (essence) of Shleshma and Raktaby Pitta and Vatadosha
Jivha (Tongue)	Rakta, Kapha and Mamsa
Mamspeshi (Muscles)	From Mamsadhatu and Vayu and Pitta
Kandara and Sira (Tendons and vessels)	From unctuous portion of Meda dhatu: by Mrudupaka –Sira (Vessel) by Kharapaka- Kandara(tendons)
Vrushan (Testicles)	Rakta, Meda, Kapha and Mamsa
Vrukk(Kidneys)	Rakta aand Meda
Hridaya (Heart)	Essence of Raktaand Kapha

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Embryological origin of organs from Dhatu and Upadhatu – Correlation

Dhatu	Upadhatu	Mala
Rasa (Plasma)	Stanya(Milk), Aartava(Ovum)	Kapha(Mucous)
Rakta(Blood)	Sira(Blood vessels), Kandara(Tendons)	Pitta(Bile)
Mamsa(Muscular tissue)	Vasa (Fat/Lipid), Shat Twacha(Skin)	Khamala
Meda(Adipose tissue/Fat)	Snayu(Ligaments)	Sweda(Sweat)
Asthi (Bone)		Nakha(Nails),Roma
Majja (Bone marrow)		Netramala Twachasneha
Shukra (Semen)		Shamshru

III. DISCUSSION:

Early embryonic development is defined in modern embryology by the establishment of the trigeminal disc, which is made up of exterior ectoderm, middle mesoderm, and internal endoderm. The creation of the trigeminal disc is a critical event in organogenesis, as it serves as the foundation for all tissues and cells that make up the eventual architecture of the entire body, including organs. The fate of distinct Germal layers in various tissues and organs is defined in the table below.

Fate of germal layer in the formation of different body tissues –

Sr. No	Germ Layer	Derivatives of Germ layers
1	**Ectoderm**[11]	Skin, Nervous tissues, hairs, nails
2	**Mesoderm**[12]	Myocytes and adipose tissues, blood cells
3	**Endoderm**[13]	Endothelial linings of vessels and organs

The development of various organs and bodily systems occurs as a result of the many germ layers.

• Liver—During the fourth week of intrauterine life, it grows from an endodermal hepatic bud (IUL).

Its genesis is endodermal.[14]

• Spleen- During the 5th week of intrauterine life (IUL), it develops from mesoderm in the dorsal mesogastrium, near to the growing stomach.

• Lungs- On the 22nd day of intrauterine life, it grows from the laryngotracheal groove. Its genesis is endodermal.

During the 21st day of intrauterine life, the heart develops from splanchnopleuric mesoderm associated to the part of the intraembryonic coelom that creates the pericardial cavity (IUL).

• Tongue—The tongue develops in the floor of the developing mouth in connection to the pharyngeal arches (1st to 4th).

It appears between the 4th and 8th weeks of pregnancy (IUL)

• Kidney- The human kidney is derived from two different sources.

The secretory portion, i.e. excretory tubules (or nephrons), is formed from the nephrogenic cord's lowest component. The metanephros is made up of cells that constitute the metanephric blastema. The ureteric bud, which emerges from the lower part of the mesonephric duct and develops during the fifth week of intrauterine life, is the collecting section of the kidney (IUL)

Gonads (testis and ovary) are formed from the nephrogenic cord's coelomic epithelium. Ova and spermatozoa are produced by primordial germ cells

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that form in the yolk sac. The testis develops in the lumbar area before moving to the scrotum. It appears between the 4th and 8th weeks of pregnancy (IUL).[15]

Following correlation may be done after watching the construction of all distinct Avayava and different aspects of embryological development of different organs, as explained in two tables below:

Avyava Utpatti as per Ayurvedaand its modern correlation –

Avayava	Utpatti	Derivatives	Embryological origin	Duration
Yakrut	Shonita	Endoderm	Mesenchymal structure of transverse septum(Hepatic bud)	4th wk
Pleeha	Shonita	Mesoderm	Dorsal mesentery as proliferating mesenchyme	5th wk
Phuphphus	Shonita phena	Endoderm	Laryngotracheal	On 22nd day
Unduk	Shonita kitta	Endoderm	An outgrowth on the midgut(bud of the caecum)	
Guda	Tridosha+Rakta	Endoderm	Blastopore of the protostomes	8th wk
Aantra	Tridosha+Rakta	Endoderm	Midgut of the primitive gut tube	4-5 th wk
Basti	Tridosha+Rakta	Mesoderm	Partly from the endogermal cloaca & partly from the ends of the wolffian ducts	10 th wk
Jihva	Kapha shonitamamsa	Ant2/3-Ectoderm Post1/3-Endoderm	Median tongue bud of the 1st pharyngeal arch	4 th wk
Vrukka	RaktaMeda	Mesoderm	Intermediate mesoderm, lying between the somites & lateral plate mesoderm	5 th wk
Vrushan	Mamsa,Rakta Kapha Meda	Mesoderm	Mesothelium as well as mesonephros	4-8 th wk
Hridaya	Shonit Kapha	Mesoderm	Splanchnopleuric mesoderm	21st day

IV. CONCLUSION:

The Avayava Utpatti is defined by Ayurveda in terms of various combinations and architectures of Dosha, Dhatu, Upadhatu, and Mala, which are the body's basic infrastructures. While current embryology uses the hypothesis of the trigeminal disc or layers (Viz. Ectoderm, Mesoderm, and Endoderm) as well as tissue differentiation theory to define the genesis of the body and organs. Finally, the Germal layers give rise to various tissues, which include cells, the structural and functional unit of the human body, as well as all organs. After a thorough examination and discussion of the similarities and differences between Ayurveda Avayava Utpatti and modern embryology theory, it was determined that Ayurveda Siddhanta of Avayava Utpatti and modern embryology of modern organogenesis.We may infer from this examination that while thought and technology were not established in ancient times, there was extensive research into embryology, including ideas such as organogenesis, as well as monthly foetal development. Some of the concepts are the same as those used in present study

REFERENCE:

[1]. Charaka, CharakaSamhita, ShariraSthana, Chapter 4, MahatigarbhavkrantiAdhyaya, versus 9-25, Chakrapani Commentary; edited by YadavjiTrikamjiAcharya, ChaukhambhaSurabharatiPrakashana,

International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 2 Mar-Apr 2022, pp: 177-183 www.ijprajournal.com ISSN: 2456-4494

Varanasi, Reprint edition 2014: p no 317-321.

[2]. Sushruta, SushrutaSamhita, ShariraSthana, Chapter 4, GarbhaVyakaranaSharira, versus 18-30, Dalhana Commentary, edited by YadavjiTrikamjiAcharya, ChaukhambhaSurabhartiPrakashana: Varanasi, Reprint edition 2014: p no 352-353.

[3]. Vagbhata, AshtangaHrudaya; ShariraSthana, Chapter 1, GarbhavkrantiShariraAdhyaya, Versus37-63; Sarvangasundar and Ayurveda Rasayana commentary; edited by PtHariSadashivShastriPrkhadkar, ChaukhambhaSurabharatiPrakashana, Varanasi; Reprinted 2014: p no. 369-372.

[4]. Kashyapa, KashyapaSamhita, ShariraSthana, GarbhavkrantiShariraAdhyaya, versus 5 to 10: Hindi Commentary by AyurvedalmkaraShriSatyapalaBhishagachar ya, Chaukhambha Sanskrit Sansthana, And Varanasi: 2009 p 72.

[5]. An article named Embryonic Development of organs – An Ayurvedic review by Dr.Akashdeep Meshram, Dr.Deveshwari Raut, Dr.Swapnil CR

[6]. Sushruta, SushrutaSamhita, ShariraSthana, Chapter 4, GarbhaVyakaranaSharira, versus 18, Dalhana Commentary, edited by YadavjiTrikamjiAcharya, ChaukhambhaSurabhartiPrakashana: Varanasi, Reprint edition 2014: p no 352.

[7]. Sushruta, SushrutaSamhita, ShariraSthana, Chapter 4, GarbhaVyakaranaSharira, versus 18, Dalhana Commentary, edited by YadavjiTrikamjiAcharya, ChaukhambhaSurabhartiPrakashana: Varanasi, Reprint edition 2014: p no 352.

[8]. Sushruta, SushrutaSamhita, ShariraSthana, Chapter 4, GarbhaVyakaranaSharira, versus 30, DalhanaCommentary, edited by YadavjiTrikamjiAcharya, ChaukhambhaSurabhartiPrakashana: Varanasi, Reprint edition 2014: p no 353.

[9]. Tripathi Brahmanand, Editor, Charak Chandrika (Hindi Commentary) on Charak Samhita, Chaukhambha surbharti prakashan ,Sharirasthana, chapter 4, verse no.24.

[10]. Shastri Ambikadatta, Editor, Ayurveda-Tattva-Sandipika (Hindi Commentary) on Sushruta samhita, Chaukhambha Sanskrit Sansthan Varanasi, edition 2005, Sharirasthan Chapter 3, verse no.30.

[11]. T.W Swadler, Langman's medical embryology; Chptaer 6, Third to eighth week: The embryonic period; 11th edition, South Asian edition; Wolter Kluwer health, Gurgaon: Third Indian Reprint 2011: p no. 63 to 69.

[12]. T.W Swadler, Langman's medical embryology; Chptaer 6, Third to eighth week: The embryonic period; 11th edition, South Asian edition; Wolter Kluwer health, Gurgaon: Third Indian Reprint 2011: p no. 70 to 77.

[13]. T.W Swadler, Langman's medical embryology; Chptaer 6, Third to eighth week: The embryonic period; 11edition, South Asian edition; Wolter Kluwer health, Gurgaon: Third Indian Reprint 2011: p no. 78 to 80.

[14]. T.W Swadler, Langman's medical embryology; Chptaer 14, Digestive system; 11th edition, South Asian edition; Wolter Kluwer health, Gurgaon: Third Indian Reprint 2011: p no. 219 to 221.

[15]. T.W Swadler, Langman's medical embryology; Chptaer6, Third to eighth week: The embryonic period; The embryonic period; 11th edition, South Asian edition; Wolter Kluwer health, Gurgaon: Third Indian Reprint 2011: p no. 67 to 87.