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ANCIENT AND CONTEMPORARY UNDERSTANDING OF ANATOMICAL AND PHYSIOLOGICAL ASPECT OF FEMALE REPRODUCTIVE ORGANS

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ABSTRACT

Woman is given prime importance in our classics since ancient times as it is the root cause for progeny. Owing to complicated structure of the female body, they are subjected to a large number of complaints associated with genital organs, interrupting her routine life. Gynaecological disorders are the one which affect the female reproductive system. To understand pathology of these gynaecological disorders, knowledge of anatomy and physiology of female genital tract is mandatory. Here an attempt is made to brief the *Shareera Vivechana* i.e. description of anatomy and physiology of female reproductive system both in *Ayurvedic* and bio-medical aspect to have a clear understanding of Gynaecological disorders.

KEYWORDS: Female Gentital organs, yoni, Aartavavahi Srotas, Vagina, Uterus.

INTRODUCTION

According to *Acharya Charaka, Sharira Rachana* and *Kriya* both are crucial in treatment because without having proper knowledge of *Prakriti* we cannot assess *Vikriti*. To understand etiopathogenesis and management of any disease the knowledge of anatomy and physiology of concerned organs is very necessary. The anatomy of the female reproductive system is not clearly described in *Ayurvedic* classics, but here and there a few scattered references are available. To understand pathology of diseases, it is necessary to understand anatomical and physiological aspects of reproductive system. Knowledge of anatomy and physiology of female genital tract is fundamental to understanding reproductive function and how both structure and function are modified by disease.

Ayurvedic view- Organs concerned to *Nirmana* and *Nishkramana* of *Raja* are-

1) Artavavaha Srotas[1]- These are two in number. *Garbhashaya* and *Artavavahi Dhamanis* are *Moola* of *Artavavaha Srostas*. The word *Garbhashaya* is composed of two words i.e *Garbha* and *Ashaya*. The word *Ashaya* means the place to rest. Thus *Garbhashaya* means space or place where the *Garbha* lies or develop.[2]

Garbhasaya is considered as one of the extra *Ashaya* in women i.e eight *Ashaya.*[3] *Garbhashaya* is situated in between *Pittashaya* and *Pakwashaya* where *Garbha* is located[4] and the third *Avarta* of *Yoni(Su.Sha. 5/43) Garbhashaya* is placed behind the urinary bladder.[5] *Vipula Kundala* of *srotas* (multiple coils of intestine) covered with *Jarayu* (peritoneum).[6] Gananathsen has mentioned the location of *Garbhashaya* in between the *Mutrashaya* and *Pakvashaya*. *Acharya Sushruta* has mentioned the shape of *Garbhashaya* like the mouth of 'Rohita fish'.[7] According to *Dalhana, Garbhashaya* has a small opening and hollow space inside.[8] In *Ayurvedic* deepika commentary, commentator has mentioned the shape of *Garbhashaya* as ''*Kshudratumbi Phala''* which is having the mouth downwards and its shape is somewhat flattened.

Artavavaha dhamani[9]-While explaining *Adhogami Dhamanis* there is mentioning of two Dhamanis meant for formation *(Pradurbhava*) and two *Dhamanis* meant for excretion (*Visarga)* of *Aartava*.

2) Yoni[10]-In *Ayurvedic* classics the word *Yoni* represents the entire reproductive system, vagina and vulva and cervix in different contexts. It resembles *Shankhhanabhi* in shape and 3 *Avartas* are present. In 3rd *Avarta* the

Garbhashaya is situated. It posseses 3 *Nadis- Sameerana, Chandramaasi* and *Gauri.*[11]

Tryavarta yoni- The *Yoni* is described to have the shape of '*Sankha'* made up of three *Avarta* and the *Garbhasaya* is situated in the 3rd *Avarta.*
1. *Prathamavarta* (the outer part of the yoni)- This is also called as '*Apatyapatha'*. The outer part of the *yoni* is *Sakatakrti*' should be in good and healthy form. *Alparoma,* medium in size and much constricted are the features of proper *Prathamavarta.*
2. *Dvitiyavarta (Garbhasaya mukha*)-The length of the *Garbhasaya Mukha* should be appropriate it should neither be too long nor be too short. It should be free from any kind of septum in any of its region.
3. *Tritiyavarta (Garbhasaya, Artava Vahinya, Antahphals)*- The *Garbha* gets situated in the 3rd *Avarta* therefore it is called as *Garbhasaya*. Its shape resemble to the rohit fish mouth, converging and narrow towards the mouth while posterior its spread and broader.[12]

3) Beeja Granthi- Analogous to the *Peshis* of *Laksana* and *Mushka* of males, the females have three more *Peshis* covering the internally situated *Phala (Beejagranthi).*[13] In Ayurvedic classics, no direct references is available regarding *Beejavahini.* In the *Ashmari Chikitsaadhaya Acharya Sushruta* forbids injury to eight vital parts among which he includes *''Phalayo''* meaning two *Phalas* indicative of *Beejagranthi.*[14] So all above references show the direct description about ovary and *Beejagranthi, Phala, Antargataphala* as synonyms of the ovary.

4) Beeja Vahini- In *Ayurvedic* classics, no direct references is available regarding *Beejavahini.* One indirect reference is available in *Sushruta Sharira Sthana.* According to *Acharya Sushruta* they are two in number, their roots are in *Garbhashaya* and *Artavavahi dhamanis.*[15]

Physiological consideration of yoni- In Ayurvedic classics scattered description about woman's life particularly in relation to the reproductive system or reproductive life is available. The life span of human being is mainly divided into three stages
**Balyavastha*
**Madhyamavastha*
**Vriddhavastha*

In female, profound anatomical and physiological changes occur during middle age. Female genital organs like *Garbhashaya* etc. are fully matured in *Madhyamavastha.* Woman is mature to achieve conception, this maturity can come even earlier if she is free from disease and has good nutrition. This stage is called *Yuvati* according to *Ayurveda.*

Modern view- The anatomical knowledge of the female genital organs and their relation to the neighbouring structures helps in diagnosing various gynaecological diseases. The organs are broadly divided into-
1) External genitalia
2) Internal genitalia
3) Accessory reproductive organs

The internal reproductive organs in female includes vagina, uterus, fallopian tubes and ovaries.[16]

Vagina- The vagina is fibro muscular membranous sheath communicating the uterine cavity with the exterior at vulva. It constitutes the excretory channel for the uterine secretion and menstrual blood. It is the organ of copulation and forms the birth canal of parturition.

Direction- The canal is directed upwards and backwards forming an angle of 45 degree with the horizontal in erect posture. The long axis of the vagina almost lies parallel to the plane of the pelvic inlet and at right angles to that of the uterus.

Diameter- The diameter of the canal is about 2.5 cm, being widest in the upper part and narrowest at its introitus. it has got enough power of distensibility as evident during child birth.

Walls- Vagina has got an anterior, a posterior and two lateral walls. The anterior and posterior walls are opposed together, but the lateral walls are comparatively stiffer especially as its middle as such it looks 'H' shaped on transverse section. The length of anterior walls is about 7cm and that of the posterior walls is about 9cm.

Fornices[17] -The fornices are the cleft formed at the top of vagina due to the projection of the uterine cervix through the anterior vaginal wall, where it is blended inseparably with its wall. There are four fornices, one anterior, one posterior and two laterals. The posterior one being deeper and the anterior is the most shallower one.

Relations of vagina- The relations are described from below upwards-
Anterior-The upper one third is related with base of bladder. Lower two third is closely related to urethra, the lower half of which is firmly embedded with its walls.

Posterior- The upper one third is related with the pouch of douglars.
-The middle third with the anterior rectal wall separated by rectovaginal septum.
-The lower third is separated from the anal canal by perineal body.

Lateral-The introitus is related with bulbospongiosus muscle, vestibular bulbs and bartholin's glands. The vestibular bulb lies deep to the bulbospongiosus muscle.

-The vaginal tube pierces the two layers of the triangular ligament approximately 1.5 cm from the introitus with in

the two layers of triangular ligament lie the deep transverse perineal muscles.
-The few medial fibres of the levator ani muscles are attached to the lower part of the vagina. Below the levator ani is the ischiorectal fossa covering loose fatty tissue.

Structures- Layers from within outwards are-
1 Mucous coat-which is lined by stratified squamous epithelium without any secreting glands. it is reddish pink in colour.
2 Submucous layer of loose areolar vascular tissues.
3 Muscular layer consisting of indistinct inner circular and outer longitudinal.
4 Fibrous coat derived from the endopelvic fascia, which is tough and highly vascular.

Vaginal secretion- The vaginal pH from puberty to menopause is acidic because of the presence of doderlein's bacilli which produce lactic acid from the glycogen present in the exfoliated cells. The pH varies with the oestrogenic activity and ranges between 4-5.

Blood supply- The arteries involved are –cervico vaginal branch of the uterine artery
-vaginal artery a branch of anterior division of internal iliac or in common origin with the uterine
-Middle rectal
-Internal pudendal

These anastomosis with one another and form two azgos arteries anterior and posterior.

Venous drainage-Veins drain into internal iliac and internal pudendal veins.

Nerve supply-The vagina is supplied by sympathetic and parasympathic from the pelvic plexus. The pudendal nerve supplies the lower part.

Support of vagina[18]
1) The vagina is supported in its upper part by the lower components of the transverse cervical ligaments which fuse with its fascial sheath. Below this, it is held by the fibres of the levator ani which are inserted into its side walls, by the urogenital diaphragm and by the perineal muscles.
2) The anterior vaginal wall, urethra and bladder base are supported by the pubocervical fascia.
3) The posterior vaginal wall rests on the rectovaginal fascia and perineal body.

Cytology of vagina[19] Cornification is well marked in the vagina of the newborn infant because of the high oestrogen level which has been transmitted from the mother. After about 10 days the vaginal epithelium becomes thinner and remains in this state until the approach of puberty. At puberty the functional layer increases in thickness. In the first half of a normal pregnancy the cornification index is low and should not exceed 10%. A progesterone deficiency is shown by a rise in the cornification index and if the index rises over 25%, The patient is liable to abort. In late pregnancy the cornification index falls even lower and at term may fall below 10%, After the menopause, although the ovaries have ceased to function, some degree of cornification is usually present, the oestrogens probably being derived from the adrenal cortex and from conversion of androstenedione into oestrone in the peripheral fat. In post menopausal phase, the vaginal epithelium, atrophies with withdrawal of oestrogen support. The epithelium becomes thin and parchment like and is prone to infection. The vaginal smear shows mainly the basal basophilic rounded cells with large nuclei. The background shows leucocytic infiltration. The superficial squamous are absent and intermediate cells are few and far between.

Natural defence mechanism of the vagina against infection- The skin of the vagina is tough stratified squamous epithelium devoid of glands. It presents a smooth unbroken surface to the attack of pathogenic organisms.

-The PH is low and high acidity mitigates against bacterial growth. The thickness of epithelium and hostile PH depends upon estrogen and therefore it is only in extreme youth before puberty and in after menopause, that bacterial inroads are likely. During the era of sexual acidity and maximum estrogen production. There are certain times in which PH is raised.
1) During menstruation when the cervix and endometrial discharge which is alkaline, tends to neutralize the vaginal acidity.
2) After abortion or labour when alkaline lochia has a similar effect.
3) Endocervicitis where excessive cervical discharge is present also has some effect.

Apart from these exceptions, the vagina is naturally self sterilizing.

Uterus- It is a hollow pyriform muscular organ situated in pelvis between the bladder in front and the rectum behind. It is normally anteverted and ante flexed. Nulliparous uterus measures about 7.5cm in length, 5cm in breadth at the site of cornua and 2.5 cm in thickness and weighs 40-50 gm.

Parts- It has three parts- Body or corpus, isthmus and cervix.

a) Body or corpus- Again divided into Fundus and Body proper. The superolateral angles of the body of the uterus projects outwards from the junction of the fundus and body are called cornua to which uterine tubes, round ligaments and ovarian ligaments are attached.

b) Isthmus-A constricted part measuring about 0.5 cm situated between the body and cervix which is limited

above by anatomical internal os and below by the histological internal os.

c) Cervix- Lower most part of the uterus .Cylindrical in shape and measures about 2.5 cm in length and diameter.
-Divided into *Supravaginal part –lying above the vagina.
*vaginal part-lies with in the vagina.
-In nulliparous- Conical with circular external os.
-In parous- Cylindrical with external os having bilateral slits.

Layers-The uterine walls consists of 3 layers-
1-Perimetrium Serous coat covers the entire organ except on the lateral borders.

2-Myometrium is formed by bundles of smooth muscle fibres separated by fibrous tissue through which the blood vessels, nerves and lymphatics run. The musculature is arranged in 3 layers-outer longitudinal, middle interlacing and inner circular layer. The longitudinal layer lies immediately beneath the peritoneum, the fibres pass from cervix anteriorly over the fundus to reach the posterior surface of the cervix. It has detrusor action during the expulsion of fetus. The longitudinal muscle fibres are attached with circular muscle fibres of the lower segment and upper part of the cervix in a bucket holding fashion. The middle interlacing layer is the thickness of the 3 and consists of bundles of muscle separated by connective tissue and as the blood vessels which supply the uterus are distributed in the connective tissues. The inner circular layer is well marked around the internal os and the openings of the fallopian tubes and can be regarded as sphincteric in action.

3-Endometrium –The mucouslining of the cavity is called Endometrium. As there is no submucous layer, it is directly apposed to the muscle coat. It consist of lamina propria and surface epithelium. The surface epithelium is a single layer of ciliated columnar epithelium. The lamina propria contains stromal cells, endometrial glands, vessels and nerves.

Blood supply
Arterial supply –uterine and ovarian artery
Vein supply- Uterine veins-corresponding veins drain into uterine veins which empty into internal iliac vein.
Nerve- Supply from the sympathetic and parasympathetic nervous system.

Fallopian tubes[20]- These are paired structures, measuring about 10cm, Situated in the medial 3/4th of upper free margin of the broad ligaments having two openings- pelvic and uterine opening and 4 parts viz. Interstitial, Isthmus, Ampulla and Infundibulum. It is surrounded by 3 layers viz. Serous, Muscular and Mucous membrane. It helps in the transport of gametes to facilitate fertilization and survival of zygote through its secretion.

Blood supply –Uterine and ovarian artery.
Venous drainage- through the pampiniform plexus into the ovarian veins.
Nerve supply derived from uterine and ovarian nerves. The tube is very much sensitive to handling.

Ovaries[21] – They are paired sex glands or gonads. shape –oval, pinkish grey coloured. Meaurements-3*2*1 cm in length, breadth and thickness respectively.
Two ends-Tubal and uterine end
Two borders- Meso-ovarium and free posterior
Two surfaces- It has two surfaces viz. Medial and lateral surfaces. The ovary is covered by a single layer of cubical cell known as germinal epithelium. It consists of outer cortex containing stromal cells. It is studded with numerous folliculitis structures during reproductive period. Inner medulla consists of loose connective tissues, few unstriped muscles, blood vessels and nerves.

Functions[22] - Repository for primordial sex cells, the woman's chromosomal endowment for procreation. It is organ for the production, ripening and monthly release of matured ova during reproductive life. It is responsible for production of steriod sex hormones in proper amount for normal growth, development and function of female.

Blood supply- Ovarian artery, a branch of abdominal aorta.

Venous drainage- Pampiniform plexus—Ovarian veins---inferior venacava on the Rt. Side and left renal vein on the Lt. side.

Nerves-Sympathetic from T10 segment. Ovaries are sensitive to manual squeezing.

Hpo axis and ovulation- Pulsatile secretion of GnRH from the hypothalamus initiates FSH and LH secretion from the anterior pituitary gland.[23]
-FSH stimulates the recruitment and growth of groups of primordial follicles.
-Follicle with highest antral estrogen concentration and lowest androgen ratio and maximum FSH receptors becomes the dominant follicle and undergo further maturation.[24]
-Along with FSH, LH causes maturation of follicle. FSH induces LH receptors on the granulosa cells of the dominant follicle.
-Due to LH surge, FSH surge, stretching factor and contraction of the micro muscles ovulation occur.
- Development of corpus luteum from the ruptured Grafian follicle depends upon LH. It has a life span of about 12-14 days. In an infertile cycle it undergoes degeneration.[25]

Menstruation- The word menstruation has its origin from the greek word 'men' meaning month. It literally meaning is the cyclic, physiologic discharge of blood and mucosal tissues through the vagina from the non pregnant uterus. It is under hormonal control and

normally recus, usually at approximately four week intervals, in the absence of pregnancy during the reproductive period of the female.[26]

CONCLUSION

Brief description regarding anatomy and physiology of Female reproductive organs is described in present paper as per both Bio-medical and Ayurvedic point of view that can prove beneficial for proper understanding of Pathology of various Gynaecological disorders.

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