SHUKRA DHATU IN AYURVEDA: AN APPROACH ALONG WITH MODERN ENDOCRINOLOGICAL ASPECT OF PHYSIOLOGY OF NORMAL MALE REPRODUCTIVE SYSTEM

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ABSTRACT

Shukra Dhatu is the extreme Dhatu of our body. Various physiological and pathological aspects of Shukra Dhatu are described in classical Ayurvedic texts. Dhairy (Patience and courage), Chyavana (Timely ejaculation), Preeti (Sexual desire) and Dehabala (Physical strength) are the principle functions of Shukra Dhatu but Garbhotpadan (Production of off-springs) is its primary vital function. Daurbalya (Generalized weakness), Panduta (Pallor), Shrama (Fatigue), Shukra Avisarga (Delayed or absence of ejaculation), Rati Anabhimukhata (Loss of libido) and Maithune Ashakti (Problematic or not satisfactory coitus) are the principle signs and symptoms of Shukra Dhatu Kshaya. Present study is carried out by making a thorough review about Shukra Dhatu which includes its status during childhood, production, nourishment, Sarvashariragatavata (Presence throughout the body), physical and functional characteristics along with the signs and symptoms of its Kshaya. Modern endocrinological aspect includes a thorough review about androgens (Testosterone) along with its childhood inhibition, production, regulation, functions and age related decline in adult males.

KEYWORDS: Shukra Dhatu, Sarvashariragatavata, Testosterone.

INTRODUCTION

Our body is made up of Dosha, Dhatu & Mala. Shukra Dhatu is the last & best extract Dhatu of our body therefore it is considered as an extreme Dhatu. Shukra Dhatu is nourished by the Aahar taken as like all other Dhatu are nourished. Various physiological and pathological
aspects of *Shukra Dhatu* are described in classical *Ayurvedic* texts. *Dhairya* (Patience and courage), *Chyavana* (Timely ejaculation), *Preeti* (Sexual desire) and *Dehabala* (Physical strength) are the principle functions of *Shukra Dhatu* as described in *Ayurveda* but *Garbhotpadan* (Production of off-springs) is considered its best primary vital function. *Daurbalya* (Generalized weakness), *Panduta* (Pallor), *Shrama* (Fatigue), *Shukra Avisarga* (Delayed or absence of ejaculation), *Rati Anabhimukhata* (Loss of libido) and *Maithune Ashakti* (Problematic or not satisfactory coitus) are the principle signs and symptoms of *Shukra Dhatu Kshaya* as described in *Ayurveda*.

By the modern human physiological point of view, major male sexual functions are under the influence of gonadotropic hormones, one of which (Luteinizing hormone) stimulates the secretion of Testosterone – the chief Androgen. Testosterone stimulates the spermatogenesis and is also responsible for the distinguishing characteristics of the normal male masculine body. Its production declines with age and older men have lower testosterone than younger, so the ageing in males is accompanied by a series of symptoms of androgen deficiency with decrease in muscle mass & strength, decrease in libido, osteopenia, decrease in cognitive performances, insomnia & decrease in general well-being. Spermatogenesis may also wane significantly with age.

**AIMS AND OBJECTIVES**

1. Review of *Shukra Dhatu*.
2. Review of endocrinological aspect of physiology of normal male reproductive system.
3. An approach to *Shukra Dhatu* along with modern endocrinological aspect.

**MATERIAL & METHODS**

A thorough review has been made by the help of following material – various classical *Ayurvedic* texts, e.g. *Charaka Samhita*, *Shushruta Samhita* etc. along with their commentaries and textbooks of modern human physiology. Relevant references were compiled, analyzed and reviewed as the method to get a thorough & in-depth understanding of the concept of *Shukra Dhatu* and to make an approach along with modern endocrinological aspects of physiology of male reproductive system.
AYURVEDIC REVIEW

Shukra Dhatu

Shukra Dhatu is the terminal tissue element of the body and is considered the Saar of all other Dhatu. Following ingestion of Ahara, Jatharagni acts on it to form Ahara Rasa which is spread and distributed into the entire body at the same time, continuously and always by the help of Vyan Vayu.\(^1\) All the seven Dhatu are naurbed at the same time due to the entry of this Ahara Rasa into channels of all seven Dhatu at the same time.\(^2\) Time taken in formation of Shukra Dhatu depends upon the status of Agni. A man with good and strong Agni, will produce Shukra Dhatu early in comparison to the other man with weak and bad Agni.\(^3\) Beside this, it depends upon Dravya taken also. Aphrodisiacs produce Shukra Dhatu immediately by their own Prabhav.\(^4\) The Shukra Dhatu formed by this evolutionary metamorphosis is pervaded throughout the body by the help of Shukradhara Kala and performs its various Sarvadaihika functions.

Sarvashariragatatva of Shukra Dhatu

Shukra Dhatu is present throughout the body in invisible form and can’t be seen even when the body is cut.\(^5\) Its presence can be understood by the following examples, e.g. – presence of Ghrita in curd, presence of juice in sugarcane or presence of oil in sesame seeds.\(^6\)

Shukra Dhatu pervades the entire body by the help of Shukradhara Kala which also pervades the entire body.\(^7\) Shukradhara Kala is not an anatomical entity present in the body, but it is a physiological phenomenon taking place in males, which has two main functions - Integrity of Shukra Dhatu by pervading it throughout the body and biotransformation of Shukra Dhatu into its visible form.

According to the well accepted seven Dhatu theory of Ayurveda, Shukra Dhatu remains available in the all age groups i.e. childhood, adult and old age. In childhood, Shukra Dhatu can be described neither it is present nor absent like the smell in and of a bud because of minuteness. Manifestation of things or qualities is necessary which exist. Shukra Dhatu becomes well manifested in the due course of the time when children grow and become adults just like the smell is manifested when flower opens its petals and filaments.\(^8\)

This Sarvasharirgata Shukra Dhatu transforms into visible Shukra Dhatu in Vrishana, which is one of the Mula Sthana of Shukravaha Srotas. From here it is transferred and stored into the Shukrashya. It is expelled out from the tip of the penis by physical, physiological and
psychological varieties of stimuli. This ejaculate is the visible form of Shukra Dhatu, which is a suspension of spermatozoa into secretions of the epididymis, prostate gland, seminal vesicles and Cowper’s glands. This visible form of Shukra Dhatu has various physical characteristics like – Snigdha (Uncutiousness), Ghana or Bahala (Dense), Picchila (Viscous), Madhura (Sweetish in taste), Avidahi (Not causing the burning sensation when ejaculate; possess slight alkaline pH of 7.5-8), Shveta or Shukla or Sita (Whitish), Sphatikabha (Translucent like alum), Avisra (Not bad smelling), Guru (Heavy), Bahu (Abundant at the time of ejaculation or having good quantity of spermatozoa), Drava (Liquified), Madhugandhi (Honey like odour) and Ghrita-Tail-Kshaudra Nibham (Looking like ghee or oil or honey).\textsuperscript{[9,10,11]}

**Functional characteristics of Shukra Dhatu**

The prime function of Shukra Dhatu is Garbhotpadana (Reproduction of off-springs).\textsuperscript{[12]}

Other important functions of Shukra Dhatu are as followings – \textsuperscript{[13]}

1. **Dhairya**\textsuperscript{[14]} – Shukra Dhatu develops patience and courage. It provides capacity to fight against conditions which are related to the physical and mental alertness. In Klaibya, one can find loss of this function of Shukra Dhatu.

2. **Chyavana**\textsuperscript{[15]} – It means ‘to secrete’ or ‘come out’ and is described as timely ejaculation, which suggests Maithunagata function of Shukra Dhatu.

3. **Dehabala**\textsuperscript{[16]} – Shukra Dhatu provides physical strength and develops working efficiency. It includes both Deha-Utsaha (Enthusiasm) as well as Deha-Upachaya (Physical fitness).

4. **Beejartham**\textsuperscript{[17]} – It means ‘Responsible factor for production of off-springs’ and Shukra Dhatu has this potential very well. When it combines with Shonita in female uterus under the favorable condition, it can develop as a fetus.

5. **Preeti**\textsuperscript{[18,19]} – Shukra Dhatu produces lust, love and sexual instinct or desire to co-habit with the opposite sex. It is examined by Tosha, which is the joyous appearance etc reflected by one’s face and eyes.

6. **Harsha**\textsuperscript{[20,21]} - This term denotes different meanings, e.g. Anand, Romanch, Kaam and Tushti etc which all are related to deriving curiosity and pleasure about repeated sexual acts. Harsha is also defined as development of sexual thoughts and maintenance of erectile state of penis.

All these functional characteristics of Shukra Dhatu can be incorporated in the human sexual response cycle also, e.g. Chyavana is the optimal timed ejaculation, Preeti is the resultant
satisfaction derived from sexual act, Dhairyā is the maintenance of anxiety at optimum levels.

**Shukra Dhatu Kshaya**

Daurbalya (Generalized Weakness), Panduta (Pallor), Agnisada (Low digestive power), Shrāma (Fatigue), Mukha Shosha (Dryness of mouth), Timira Darshana (Black outs), Medhra-Vrishana Vedana (Pain in scrotum and penis), Medhra Dhumayana (Burning sensation in penis or urethra), Chirat Praseka or Alpa-Rakta-Yukta Shukra Pravritti or Shukra Avisarga (Delayed or blood mixed or no ejaculation), Rati Anabhimukhata (Loss of libido) and Maithune Ashakti (Problematic or not satisfactory coitus) are the signs and symptoms of Shukra Dhatu Kshaya.\textsuperscript{[22,23,24,25]}

**MODERN REVIEW\textsuperscript{[26]}**

**Endocrinal aspect of physiology of male reproductive system**

Major control of sexual functions begins when secretion of GnRH (Gonadotropin-releasing hormone) in significant amount commences from hypothalamus which stimulates the anterior pituitary to secrete gonadotropic hormones (LH & FSH). Spermatogonia, which remain dormant during childhood, now begin to produce sperms actively under the influence of these gonadotropic hormones.

LH (Luteinizing hormone) stimulates testicular interstitial cells of Leydig to secret testosterone. During fetal life, this gonadotropic stimulation of testosterone is absent because of the insignificant secretion of GnRH from hypothalamus.

Testosterone begins to be elaborated by the male fetal testes at about the 7\textsuperscript{th} week of embryonic life. Firstly the male sex chromosome causes the newly developing genital ridge to secrete testosterone. After that, hCG stimulates the testes to produce moderate quantities of testosterone throughout the entire period of fetal development. This testosterone production remains continue for ten or more weeks following termination of this hCG stimulus or birth because of the presence of numerous functioning testicular interstitial cells of Leydig in the newborn male infants. After that, testosterone is not produced during childhood until about the ages of 10-13 years because of the absence of any stimulus to the Leydig cells.

At the onset of puberty, GnRH secretion breaks through the childhood inhibition and testosterone production increases rapidly under the stimulus of gonadotropic hormones and adult sexual life begins. Following puberty, gonadotropic hormones are produced and
testosterone secrets throughout most of the remainder of life and at least some spermatogenesis usually continue until death.

Testosterone directly acts and stimulates the spermatogenesis. It is essential for growth and divisions of germinal cells. FSH (Follicle stimulating hormone) mainly stimulates spermatogenesis by causing Sertoli cells to grow and to secrete various spermatogenic substances which organize full maturation of spermatids into spermatozoa. Estrogens, derived from testosterone by the Sertoli cells under FSH stimulation, are also essential for the maturation of spermatids.

Both Testosterone and FSH have the negative feedback effect on their stimulating hormones. Beside this, many psychic factors also affect the rate of secretion of GnRH and other aspects of sexual and reproductive functions also.

**Androgens - Male Sex Hormones**

‘Androgens’ are defined as all steroidal hormones produced elsewhere in the body that have masculinizing effects. Masculinizing effect of adrenal androgens is <5% of the total in an adult male which can’t cause significant masculine characteristics in women. Interstitial cells of Leydig in the testes secret the chief androgen – Testosterone, in significant amount. Testosterone is responsible for the distinguishing characteristics of the male masculine body.

Main functions of the testosterone are as following –

1. Male sexual development during fetal life.
2. Descent of the testes.
3. Development of primary sexual characteristics.
4. Development of secondary sexual characteristics, e.g. –
   a) Male pattern body hairs distribution - Growth of hairs over pubis, upward along the linea alba, on the face and chest.
   b) Baldness – Decreased growth of hairs on the top of the head.
   c) Adult masculine voice – due to the hypertrophy of the laryngeal mucosa and enlargement of larynx.
   d) Increased skin thickness.
   e) Acne – due to the increased secretion of sebaceous glands of the face especially.
   f) Increased muscle mass.
   g) Increased bone matrix and calcium retention.
h) Increased protein anabolism – which is associated with increase in skin thickness, increase in muscle mass, hypertrophy of laryngeal mucosa, enlargement of larynx, increase in bone matrix and increased calcium deposition, perhaps.

i) Increased number of RBCs.

j) Increased BMR – associated with increase in number of RBCs.

k) Increased sodium reabsorption in the kidneys.

**Testosterone in elderly and old age**

Androgen production declines with age and older men have lower testosterone levels than younger men but it happens gradually so the men don’t exhibit age-related sudden decline in gamete availability, but there is some compromise is found in sperm production and quality.

From the age of 30, the FT (free testosterone) level decreases continuously with age. Bio-available and free testosterone levels decline by about 1% and 1.2% per year respectively, after the age of forty therefore most men begin to exhibit slowly decreasing sexual functions in their late 40s or 50s. Testosterone level dwindles rapidly beyond the age of 50 and becomes 20-50% of the peak value by the age of 80 years. Statistics shows that the mean total testosterone level at the age of 70 is approximately 66% of the mean level at the age of 25, whereas mean FT level is only 40% of the mean level in young adults. The decrease in FT levels is one of the factors responsible for signs and symptoms of the aging male.

Ageing in males is accompanied by a series of signs & symptoms of androgen deficiency in young adults, e.g. decreased muscle mass & strength, increased abdominal fat with insulin resistance and atherogenic lipid prolife, decrease in libido & sexual hairs, osteopenia, decrease in cognitive performances, insomnia, excessive sweating & decrease in general well-being but spermatogenesis may not wane significantly with age.

**DISCUSSION**

Functional aspect of the *Shukra Dhatu* indicates that complex sexual behaviour in males, which includes Erection, Ejaculation and Orgasm, is due to the *Shukra Dhatu* and these functions of *Shukra Dhatu* can be compared to the systemic functions of Androgens i.e. Testosterone also.

Besides this, some synonyms are also available for *Shukra Dhatu* which are helpful to identifying it as an Androgen derivative, e.g. *Veerya* (Potency, by which an action is performed), *Paurusham* (Virility, which is inherited in a man), *Bala* (Power) and *Teja*. Causativity of male sex chromosome behind testosterone secretion from newly developing
genital ridge proves *Pitrija Bhavatva* of *Shukra Dhatu*. Acne during puberty is an indicator of increased rate of production of *Shukra Dhatu* and thus its *Mala* also which resembles high rate of production of Testosterone hormone during that period.

Testosterone hormone is the chief Androgen, which have masculinizing properties and facilitate the growth of sex organs, development of secondary male sexual characters, spermatogenesis and muscular development. Ageing in males is accompanied by a series of signs and symptoms of androgen deficiency in young adults.

**CONCLUSION**

1. *Shukra Dhatu* has multifunctional identity, out of which it is the main responsible factor in reproduction, better physical health and better sexual life. Thus it can be closely correlated with the chief Androgen – Testosterone.

2. *Shukra Dhatu Kshaya* may hamper the functions of *Shukra Dhatu* severely. Thus its *Kshaya* can also be compared easily to the condition associated with low serum testosterone levels.

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