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Anatomical, Physiological and Pathological Study of *Shuddha Shukra* in Modern Parameters

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ABSTRACT

Many concepts of *Ayurveda* are relevant in present day science. *Shudhhashukralakshana* is one of them. *Shukra* is *Dhatu* which is considered as best among all seven *Dhatu*& it is meant principally for reproduction. Our *Acharyas*has said about the *shudhhashukralakshana* which are nothing but observational parameters of semen analysis. *Shudhhashukralakshana* is morphological parameters which relates to physical and chemicalcharacteristics based on which given semen sample can be called as pure. In other words sperm should be fully capable of fertilizing ovum and capable of producing healthy progeny. Here in this article we will discuss about *shudhhashukralakshanas* said by our *Acharya* and we will interpret their meanings in the context of parameters of semen analysis.

KEYWORDS

Shuddhashukralakshana, Semen analysis

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INTRODUCTION

Ayurveda is most ancient medical system and mother of all medical sciences present today. Concepts and theories regarding various aspects of medical sciences have been proposed by our Acharyas. Ayurveda is tradition of Aaptapurusha.Acharyas which were with enlightened soul filled with satva and due to absence of raja and tama, every wordwas true and authentic. In other words we can say that every word were theories which we are illustrating and understanding in the light of modern science in present time. No doubt, it is amazing that how so precise theories were proposed thousands of years ago when no chemical analysisand microscopic methods were discovered.In the light of modern medical science, we can understand, interpret and feel proud of our legacy. Out of many concepts,shudhhashukra is one. Shudhhashukralakshana can be meant as macrospopic and physical properties of semen sample having capability of proper fertilization. Its modern counterpart is semen analysis.

SHUDHHA SHUKRA LAKSHNA[1,2,3,4,5]

ShuddhaShukra (normal semen) is Shukla (white) or Sphatikabha (whitish as Quartz stone). It can be having colour as of Taila (oil), Gruta (ghee) andMadhu (honey) in Vata, Pitta and Kaphaprakriti.ShuddhaShukra is having properties likepicchilata (liquid of mucoidconsistancy) or drava (clear liquid) having snigdhata (moisture). As color, viscosity may be similar to that of Taila, Grita or Madhu. All these varna(color) are considered as normal.ShuddhaShukra smells like madhur (sweet), Madhu Gandhi (smell of honey) and vistragandhi (fishy or chlorinated smell). It is soumya and avidahi. It is guru, Ghana, bahal and bahuh. Semen having all the above properties is said to bephalavattadasansayam(undoubtedly capable of carrying out fertilization and resulting into a healthy progeny).

COMPOSITION OF SEMEN[6,7,8]

Semen or seminal fluidis an organic fluidproduced by the male reproductive organs. It is composed of spermatozoacells along with fluids secreted from testes, epididymis, seminal vesicles, prostate and bulbourethral gland. Each component of semen differs in chemical properties and function. The combination of these components during ejaculation which is called semen, helps spermatozoa to reach female reproductive tract protected from acidic environment enabling it to carry out successful fertilization.

Table 1 Composition of Human Semen

Composition	Fractional contribution	Description of components
Testis and epididymis	2–5%	40 to 200-million spermatozoa /ml of semen , other fluids from testis and epididymis
Seminal vesicle	65-75%	Fructose (main energy source for the sperm), proteins, citric acid, potassium , phosphorusand prostaglandins, Amino acids, citrate, enzymes, proteins, vitamin C, coagulating enzymes
Prostrate	25-30%	Prostate specific antigen (liquefies semen coagulum), , Citric acid, Prostatic acid phosphatase, zinc, spermineand prostatic inhibin
Bulbourethral gland	≤ 1%	Mucus, galactose

MODERN SEMEN ANALYSIS[9,10]

Semen analysis,analyzes and evaluates semen and spermatozoa in it for certain parametersand characteristics by comparing it with established normal limits. Semen analysis evaluates physical and chemical characteristics semen and sperm appearance, liquification, pH, motility, sperm count, motility etc.A semen analysis evaluates certain characteristics of a man's semen andthe sperm contained in the semen. It is an essential component of maleinfertility investigation, and interpretation of the results plays a vital rolein the overall treatment of infertile couples. The basic aim of semen analysisis to evaluate semen for different descriptive parameters of the ejaculated semen sample.

Macroscopic Examination of semen

Liquefaction

Normal sample usually liquefies within 15-20 minutes although rarely it may take up to 60 minutes or more.If not liquefies within 2 hours, indicates poor prostatic secretion since the liquefying enzymes arederived from the prostate gland. On the other hand, absence of coagulationindicateobstruction of ejaculatory duct or congenital absence of seminal vesicle or its duct.

Color and Odor

Normal semen is homogeneously opaque,whitish,whitish greyish or pearly white. A yellowish tinge to the semen appears withan increase in the days of abstinence or probably due to carotene pigment.More pronounced yellow discoloration may indicate jaundice or contamination of semen with urine.

Odor

Normal semen has fishy or chlorinated smell which sometime may be pungent. Prostatic secretions give semen a strong distinctive odor. Absence oruncharacteristic odor could be associated with an infection.

Volume

The normal volumeof ejaculate after 2-5 days of sexual abstinence is about 2-6 mL

with reference value as 2 ml. Retrogradeejaculation, obstruction of lower urinary tract (urethra, congenital absenceof vas deferens, seminal vesicles) may yield low volume. For clinical purposes; semen volume is differentiated intothree categories to facilitate interpretation and diagnosis;Aspermiawhenno semen produced after orgasm, Hypospermia when <0.5 mL of semen ejaculated and Hyperspermia when> 6 mL of semen ejaculated.

Viscosity

Viscosity of semen can be estimated byobserving the length of thread on glass rod after withdrawing from semen sample.High viscosity decrease sperm motility and antibody coating ofspermatozoa. Viscosity can be categorized as 'normal', 'moderate' or 'high.'

pH

pH of Normal semensample is in between the ranges from 7.2 to 8.2. Any inflammatory conditions of prostate or seminal vesicles may alter pH of semen.

Microscopic examination of semen

Sperm count and Concentration

Determination of sperm concentration (million/ml of ejaculate) andtotal sperm count (million sperm per ejaculate) can be done by microscopic examination. The sperm count in a Normal sperm count of semen sample ranges from 40 million to 200 million per ml of semen. This is also referred as as sperm density. If this number is low, conceiving can be more difficult.

Sperm Motility Assessment

Ratio of the number of motile sperm to the total numberof sperm in a given volume of semen sample is called Sperm motility and it is expressed in percentage. A normal semen analysis must contain at least 50% of motilespermatozoa.If the ejaculate show less than 50% of motile sperm then person is considered asasthenozoospermicand if all sperms are seems immotile then as necrozoospermic.

Evaluation of Morphology Assessment

For aassessment of themorphological characteristics of the spermatozoa, staining of semen sample is done.Spermatozoa abnormalities may be categorized as defects of head, neck andmiddle piece and tail.For a spermatozoon to be capable of fertilization, more than 30% of spermatozoa must have their head, neck, middle piece and tail with normal morphology.

Hypo-osmotic Swelling Test (HOS)

The HOStest is based on the principle that live spermatozoa withstand moderatehypo-osmotic stress. Dead spermatozoa in which the plasma membrane isno longer intact do not swell, whereas senescent cells show

uncontrolledswelling that finally results in rupture of the distended plasmamembrane.Normal values (fertile):> 60% spermatozoa with swollen tailsAbnormal values (infertile): < 50% spermatozoa with swollen tails.An HOS result < 50% is associated with increased miscarriagerates.

Antisperm Antibodies

Sperm are Immunological separated from systemic immune defense system antigens by the tightjunctions of Sertoli cells forming the blood-testis barrier. The spermatozoonevokes an immune response when exposed to the systemic immune defensesystem. In conditions in which this barrier gets disrupted, formation ofantisperm antibodies (ASA) may occurwhichmay lead to sperm dysfunction.Certain ASAs have a cytotoxic effect on the spermatozoa and can causecell death and immobilization of sperm cells.

Normal Reference Values of Semen Variables

According to the World Health Organization guidelines (WHO, 1999) the following reference values for the semen sample are suggested:

Table 2 Reference Values of Semen Variables

Parametrers	**Reference value**
Volume	≥ 2 ml
pH	≥ 7.2
Sperm concentration	≥ 20 × 106 spermatozoa/ mL
Viability	≥ 75% alive
Motility	≥ 50% motile within 60 minutes of ejaculation
White blood cells	< 1 × 106/mL
Immunological test	< 50% motile spermatozoa with beads bound

DISCUSSION

Sphatikabham/Shukla- Semen is havingcrystalline white or milky white appearance due to presence of prostatic secretions. Semen can be opaque or translucent with white, grey and even slight yellowish tint. Based on Prakruti, it can be of the colour of Taila (oil) in Vataprakriti, Gruta (ghee) in Pitta or Madhu (honey) in Kapha.

Dravam- Semen has predominance of JalaMahabhuta.Semen is composed of 2% spermatozoa and 98% fluids obtained from secretions of different glands. This liquidity ensures proper movement of spermatozoa. Lack of liquidity in semen sample indiacatesdiminished glandular secretions. It also indicates towards normal liquificationwithin normal time period which is normally 15 min after ejaculation but can take up to one hour to liquefy. Liquefaction of semen is due to coagulating proteins originate within the seminal vesicles and coagulating enzymes are derived from the prostate gland. Absence of coagulation indicates absence of seminal vesicles secretions or congenital absence of seminal vesicles

gland. Prolonged liquefaction time indicates poor prostatic secretion.

Snigdham- Semen has predominance of *JalaMahabhuta* , having 98% liquid content. Semen is viscous, rich in nutritive component like fructose, lipids, amino acids and proteins. Additional moisturization or lubricationto semen is provided by mucous secretion of bulbourethral gland.

Madhuram- Presence of fructose from seminal vesicle and slight alkaline pH makes semen somewhat sweet in taste. It also contains albumin and amino acid by 50 % by weight.

Madhugandhi- Normally a semen sample smells like chlorine,fishy odour or may be pungent. Smell may variate according to diet. Smell of semen like honey is not understood.

Bahalam- Semen is thick and viscous. Proper viscosity just after ejaculation is key factor which protects spermatozoa from hostile acidic environment of female genital tract.

Vishtram- Semen is having fishy, chlorinated and pungent smell due to alkaline pH and different chemicals substances present in it.

Guru- Predominance of JalaMahabhuta makes semen Guru. Semen is itself a nutritive medium which supports and provides nutrition to spermatozoa. Semen is viscous, rich in nutritive component like fructose, lipids, amino acids and proteins. The amino acid content of semen is much higher than that of blood plasma. Semen comprises protein 50 % by weight. All these make semen of Guru. This is also attributed by viscosity and specific gravity.

Pichhilam- Pichchila is the property of a substance to stick. It indicates towards normal viscosity of semen. Semen just after ejaculated is very viscous. Coagulating chemicals from seminal vesicle coagulates semen into a very thick mass called coagulum or globules. This initial coagulation is very important because it protect sperms from hostile female acidic tract. Mucusadded by bulbourethral gland serve to increase the mobility of sperm cells in the vagina and cervix by creating a less viscous channel for the sperm cells to swim through. It contributes to the cohesive jelly-like texture of semen. Viscosity is can also be attributed by liquefaction time. Ayurvedic parameters of viscosity are *Apichchila* (non viscous), *Tailabha* (oil like), *Gritabha* (ghee like), *Madhwabha* (honey like) and *Atipichchila*(highly viscous).

Bahuh- Bahuhguna of semen is related to normal quantity of semen. 1.5- 6 ml is considered as normal quantity of semen. It also indicated towards sperm count which should be within normal limit either it will

be not capable of fertilizing ovum. There should be abundant or sufficient number of sperm in semen to furnish fertilization.

Ghanam- It can be correlated to consistency of semen. However there is any no significant relation between semen density and sperm counts but diminished consistency may shows diminished nutrient value of seminal plasma as well as diminished concentration of Spermatozoa in seminal fluid(Oligospermia). It also indicates towards decreased specific gravity. Semen may appear less opaque if the sperm concentration is very low. *Ghanata*indicates proper coagulation mechanism, proper quantity on nutrients and good concentration of sperm cells in semen.

SoumyaevamAvidahi - Semen has predominance of *JalaMahabhuta* ,shukra is derived from Soma and has slightly alkaline pH. All these indicate its *Soumya*properties. Shukra should be avidahi that means it should be soumya. In other word we can say that semen should possesses alkaline pH not acidic.

Phalavat- Semen possessing all the above qualities is definitely capable of fertilizing egg and producing healthy progeny.

CONCLUSION

Concept of shuddhashukralakshana clearly indicates towards Physical or macroscopic attributes of semen sample having allphysico-chemical properties within physiological limits. Though not so precise in explaining microscopic, cellular and chemical composition but our ancient Acharyas presented a way to understand semen pathology which can be estimated with the help of shuddhashukrapariksha. Parameters established by ShukraPareeksha are valid even today and shows a significant correlation with the components and parameters of modern semen analysis.

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