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A Conceptual Study On Understanding Shukra Dhatu As Reproductive System

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Abstract:

Shukra Dhatu, the seventh and final dhatu in Ayurvedic physiology, plays a crucial role not only in reproduction but also in maintaining overall vitality and health. Traditionally equated with semen in males, its broader implications include neuroendocrine coordination, hormonal balance, mental well-being, and systemic strength. This article comprehensively explores the concept of Shukra Dhatu from Ayurvedic texts—*Charaka Samhita*, *Sushruta Samhita*, *Ashtanga Hridaya*—alongside its physiological correlations in modern biomedicine such as spermatogenesis, testosterone production, and reproductive endocrinology. By understanding the layers of Shukra—from *Sukshma* (hormonal) to *Sthula* (seminal)—and its relation with *ojas*, *bala*, and overall health, this study proposes an integrative framework of the reproductive system, including male and female perspectives. Special attention is given to the time of formation (*Kaala*), locations (*Sthana*), reduction (*Kshaya*), and enhancement (*Vruddhi*) of Shukra, along with its *panchabhautika* constitution and involvement of *Shukravaha srotas*. Bridging classical wisdom and modern research, this article highlights the necessity of adopting a wider perspective of reproductive health beyond the limitations of sperm count or testosterone levels.

Conclusion: Shukra Dhatu in Ayurveda denotes a comprehensive reproductive system encompassing hormonal balance, gametogenesis, neuroendocrine regulation, and psychological well-being. It parallels modern concepts of reproductive and endocrine health, including testosterone and estrogen functions, spermatogenesis, ovulation, and libido regulation. This understanding emphasizes Shukra as a dynamic, functional system rather than a mere anatomical entity, bridging Ayurvedic philosophy with contemporary biomedical science.

Keywords

Shukra Dhatu, Reproductive System, Sukshma Shukra, Ojas, Testosterone, Spermatogenesis, Bijarupa shukra

INTRODUCTION

Ayurveda, the ancient science of life, defines seven essential *dhatu*s (tissues) responsible for the structural and functional integrity of the human body. Among these, Shukra Dhatu is the seventh *dhatu*, representing the most refined and potent essence responsible for reproduction and vitality¹. Shukra not only denotes semen in males but also implies the totality of reproductive tissues and neuroendocrine mechanisms essential for procreation and vigor².

The synonyms of Shukra as cited in *Amarkosha* include Teja, Retas, Bija, Virya, and Indriya—indicating its diverse physiological and functional roles beyond simple reproductive material³. These terms represent concepts ranging from potency and vitality (*Virya*) to germ cells (*Bija*) and even **mental and sensory faculties (Indriya)**⁴. This aligns with the modern understanding of the reproductive system as a complex interplay between gonadal function, hormonal control, and neural pathways.

Ayurvedic literature presents a multilayered concept of Shukra, categorizing it into **Sukshma Shukra** (subtle form) & **Sthula Shukra** (gross form). **Sukshma Shukra** refers to androgens like testosterone and estrogens, secreted throughout the body⁵. **Sthula Shukra** represents the seminal fluid, including spermatozoa formed and ejaculated through *Vrushana* (testes) and *Shefa* (penis)⁶.

Modern biomedical science discusses the hypothalamic-pituitary-gonadal axis, spermatogenesis, testicular function, and endocrine regulation of reproductive health. These functions closely resemble the Ayurvedic description of Shukra Dhatu and its production from *Majja Dhatu*, indicating a connection between bone marrow-derived stem cells and reproductive potential⁷. Thus, understanding Shukra Dhatu as a complete reproductive system—including physical, physiological, hormonal, and psychological dimensions—is essential in creating an integrated approach to reproductive health.

METHODS

The study is conceptual and review-based, synthesizing classical Ayurvedic literature with current biomedical understandings. The primary sources include Charaka Samhita, Sushruta Samhita, Ashtanga Hridaya, and Astanga Sangraha, along with Sanskrit commentaries (Chakrapani, Dalhana, Arundatta). Modern references are drawn from Guyton's Physiology, Ganong's Review of Medical Physiology, and peer-reviewed research on male reproductive physiology and neuroendocrine integration.

The analysis uses a thematic mapping approach, linking each classical description (e.g., Utpatti, Kaala, Sthana) to modern correlates like spermatogenesis, testicular development, neurohormonal regulation, and stem-cell-based research on gametogenesis. Sanskrit verses are quoted and interpreted contextually, supported by current literature where applicable.

RESULTS

A) Utpatti of Shukra Dhatu (Formation of Shukra)

Shukra Dhatu originates as the final refinement in the dhatu transformation process, evolving from Majja Dhatu (bone marrow) ⁸. According to Charaka:(Charaka Chikitsa Sthana 15/32–33)⁹This implies that bone marrow (Majja) plays a foundational role in Shukra production. Modern parallels include the stem-cell origin of spermatozoa from bone marrow-derived pluripotent cells¹⁰. The porosity of Asthi (bones) enables the exudation of Shukra, metaphorically likened to how ghee melts by heat, reflecting the bioavailability of hormones or fluids during excitation¹¹.

Additionally, Ayurvedic scholars suggest the “mastishka-gata majja” (brain-derived essence) hints at the hypothalamic-pituitary control over testicular function (e.g., FSH, LH, GnRH axis)¹².

B) Kaala – Time Taken to Produce Shukra Dhatu

Multiple classical views exist regarding the time required for Shukra formation:

- Acharya Parashara:
Rasa → Shukra in 8 days through successive transformation¹³.
- Acharya Sushruta:
Takes one month for Shukra Dhatu to form from Rasa¹⁴.
- Charaka's View:
Suggests instantaneous transformation of milk into Shukra under specific conditions.

This difference of opinion might indicate a context-dependent variability, possibly reflecting the speed of physiological response based on pathology or nutrition¹⁵ Modern science supports that spermatogenesis takes approximately 72–74 days, aligning with the concept of prolonged maturation from precursor tissues to final gametes¹⁶.

C) Sthana – Location of Shukra Dhatu

Ayurveda presents Shukra as pervading the entire body, not just confined to testes:

- Charaka:
“Just as oil in sesame, or juice in sugarcane, Shukra exists throughout the body¹⁷.
- Sushruta:
Ghee-in-milk analogy — Shukra is omnipresent yet subtle¹⁸.
- Vriddha Vagbhata:
Shukra exists as both Sukshma (hormonal/neuroendocrine) and Sthula (seminal) forms, supporting the idea of systemic androgenic hormone distribution¹⁹.

This correlates well with the widespread distribution of testosterone receptors across muscle, brain, skin, and bones in modern physiology²⁰.

D) Shukra Kshaya – Deficiency of Shukra

Shukra Kshaya leads to both physical and psychological symptoms as outlined comprehensively in classical texts:

Text/Author	Symptoms of Shukra Kshaya	
	Physical symptoms	Psychological symptoms
Charaka (Ch.Su.17/69)	Daurbalya (weakness), Pandutva (pallor), Shrama (fatigue), Kshaya (wasting), Klama (exhaustion) ²¹	Manasika Bhaya (mental fear), Smruti Kshaya (memory loss) ²¹
Sushruta (Su.Su.5/9)	Klaibya (impotence), Timira (blurred vision), Shwasa (dyspnea), Aruchi (loss of taste), Sopha (edema), Shukravisarga (non-ejaculation), Ardita (facial paralysis), Tvaka Vikara (skin disorders) ²²	There is no direct explanation on Psychological symptoms in the shloka.
Ashtanga Hridaya (A.H.Su 11/20)	Shukram cirat prasicyet(Delayed ejaculation), Shukram Shonitameva(ejaculation accompanied with bleeding), Atyartha Toda Vrsana(severe pain in the testicles), and Medra	There is no direct explanation on Psychological symptoms in the shloka.

	Dhumayativa(feeling of hot fumes coming out of urethra) ²³	
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Modern parallels include:

Hypogonadism: low testosterone, fatigue, loss of libido.

Sperm disorders: oligospermia, asthenospermia, azoospermia²⁹.

It validates Ayurvedic understanding of Shukra Kshaya as a multi-system disorder rather than local pathology.

E) Shukra Vruddhi – Hyperfunction or Excess of Shukra^{30,31}

Two conditions are described:

Shukrashmari: Analogous to spermatic calculi or testicular congestion³⁰.

Ati-pradurbhava: excess production of shukra³⁰. i.e neuroendocrine overactivity or hypersexuality.

Ati-stree kamatva: increased sexual desire linked to neuroendocrine overactivity or hypersexuality³¹.

Modern interpretations: may include hypergonadotropic states or excess androgen levels, sometimes seen in behavioral disorders or tumors.

DISCUSSION:

The concept of Shukra Dhatu in Ayurveda transcends the simplistic understanding of semen. It encompasses a multi-dimensional tissue that serves as both a reproductive substrate and a critical determinant of vitality, mental health, and systemic balance³⁵. The distinction between Sukshma Shukra (subtle form) and Sthula Shukra (gross form) allows us to draw parallels with hormonal regulation and seminal physiology in modern medicine³⁵.

Integrated Reproductive Physiology-

Shukra as a Reproductive System – Various Contextual Meanings:

The term “Shukra” in Ayurvedic literature encompasses a broad spectrum of meanings depending on its usage and context. It is not confined merely to the biological sperm but denotes a complex and holistic concept representing fertility, vitality, tissue integrity, and reproductive potential.

1. Shukra as a Determinant of Prakruti (Constitution)

According to Charaka Samhita, Prakruti or the innate constitution of an individual is determined at the time of conception and is primarily influenced by the Shukra (sperm) and Shonita (ovum) of the parents³⁴. The prakruti reflects the physical, physiological, and psychological traits of an individual.

Explanation:

Shukra here refers to the male reproductive contribution during conception, genetically and epigenetically. This is comparable to modern genetics where DNA from sperm contributes to the zygote. The quality of Shukra at the time of conception is crucial in determining constitutional traits such as Dosha predominance, immunity, and temperament.

2. Shukra as a Whole Reproductive System / Dhatu

Ayurveda describes Shukra Dhatu as the essence of all preceding Dhatus (tissues), representing the entire reproductive potential, not just semen³⁵. This includes:

A. Physical Health of the Reproductive Organs

Healthy organs like the penis, testes, prostate, and their structural integrity (no ulcers, injuries, or deformities) reflect the strength of Shukra Dhatu (Dehabala). Disorders like BPH, penile fracture, or structural anomalies indicate a disturbance in the Dhatu.

B. Physiological / Functional Health:

This includes the endocrine and secretory actions of reproductive organs:

a)Primary action of Testes: Spermatogenesis:

“Shukrat garbha prajayate”³⁵ which means the embryo originates from Shukra.

In modern physiology, this refers to spermatozoa, the male reproductive cells produced through spermatogenesis, which are essential for fertilizing the ovum and initiating the formation of the embryo.

“Garbhotpadasya dhatunam shreshtha karma”³⁶

i.e Among all bodily tissues (dhatus), the creation of the embryo is the most superior function.

This emphasizes that spermatogenesis, the process of producing healthy sperm from Shukra Dhatu, is considered the highest physiological role of the body's tissues, enabling reproduction and continuation of life

b)Secondary action of Testes: Hormonal secretions influencing:

Dhairya (Courage), Preeti (Affection), Harsha (Excitement), Dehabala (Physical Strength) and Viryartha (Reproductive Strength) “Harshabala viryartha” – As. Su. 19/3³⁶

These functions are mainly governed by testosterone, paralleling the Ayurvedic concept of Virya and Bala.

Explanation:

After puberty, the emergence of masculine characteristics and reproductive capability symbolizes Shukra's functional maturity, analogous to the flower blooming with fragrance.

C. Mental Health and Neuro-Endocrine Integration

Mental stability, libido, sexual desire, and the capacity for emotional bonding are mediated by neuroendocrine interactions, symbolized by Shukra in Ayurveda.

Shukra as an Indriya (sense organ) influences Harsha and Preeti. A balance in Shukra reflects healthy sexual thoughts, arousal, and ejaculation mechanisms, coordinated through hypothalamic and pituitary axis in modern physiology.

3. Shukra as Semen / Reta

Charaka has described Reta (synonymously used with Shukra) in terms of its physical qualities³⁷:Healthy shukra in terms of semen or reta is Snigdha, Ghana, Pichila, Avidahi, Sphatika Sannibha, Madhugandhi³⁷

Explanation:

These descriptions are symbolic of healthy semen parameters, such as optimal viscosity, volume, color, and pH – much like the modern WHO semen analysis criteria. Abnormalities such as watery semen, burning sensation, foul odor, etc., point to Shukra Dushti.

4. Shukra as Bijarupa Dhatu (Germinal Element / Spermatozoa):

In Ch. Sha. 2/4 (Atulyagotriya Adhyaya), Shukra is considered the Bija (seed) or germinal factor³⁸. It is the biological equivalent of spermatozoon in modern medicine. The Bija Bhaga (genetic portion) and Bija Bhaga Avayava (structural units like chromosomes or DNA) help understand congenital or hereditary diseases.

Explanation:

This concept parallels genetics and embryology, where structural and functional defects in sperm DNA can lead to infertility or congenital anomalies. The term “Shukra Dosha” is now comparable to chromosomal disorders, DNA fragmentation, or oligo/astheno/teratozoospermia.

5. Shukra as Indicator of Well-being and Homeostasis:

“Shukra shariram dharayati balam oja ca vardhayati” – Sha. Su. 15/5³⁹

Explanation:

Shukra is the final Dhatu and is the most refined. When it is well-nourished, it signifies that all preceding Dhatus (Rasa → Rakta → Mamsa → Meda → Asthi → Majja) are also healthy. The Uttara-Uttara Dhatu Poshana Nyaya implies that Shukra nourishes Ojas, the essence of vitality and immunity.

- Proper functioning of Shukra reflects systemic health.
- If Shukra is weak or vitiated, it may imply poor nourishment of Dhatus, resulting in fatigue, sexual debility, or lowered immunity.

Modern Interpretation:

Shukra Dhatu thus acts as a biomarker of general wellbeing, reproductive strength, anabolic health, and endocrine balance.

Shukra and Female Reproductive Physiology:

In females, while Shukra is not involved in embryo formation per se, it contributes to the neurohormonal and glandular responses necessary during coitus⁴⁰. According to Chakrapani and Vriddha Vagbhata, women possess Shukra, but it plays a different role—contributing to Preeti (affection), Harsha (pleasure), and overall sexual functioning⁴¹.

This could be linked to:

- Estrogen and oxytocin secretion
- Pheromonal and psychological readiness
- Clitoral and vaginal secretions

Modern research supports the existence of female ejaculate and prostatic-like secretions, suggesting a functional parallel to male Shukra, although not involved in fertilization⁴².

Shukra, Ojas, and Systemic Vitality

In Ayurveda, Ojas is considered the essence of all Dhatus, derived from well-nourished Shukra⁴³. This reflects the belief that reproductive health is a barometer of general health, especially in males, where low testosterone and infertility are often accompanied by:

- Fatigue
- Loss of muscle mass
- Mood disturbances
- Metabolic syndrome⁴⁴

Thus, the Ayurvedic principle of Uttara-Uttara Dhatu Poshana (each dhatu nourishing the next) culminating in Shukra, and then Ojas, mirrors the sequential dependency of physiological systems.

Conclusion

Shukra Dhatu, as described in Ayurvedic texts, is not merely a representation of seminal fluid or gametes, but a complex, systemic entity encompassing reproductive function, endocrine balance, neuropsychological behavior, and vitality. The layered description—from Sukshma to Sthula, from Bijarupa to Ojas-poshaka, and from Dhatu to Srotas—presents a holistic view of reproduction.

In modern terms, Shukra can be correlated with:

- Testosterone and estrogen production
- Spermatogenesis and ovulation
- Neuroendocrine control of libido and sexual response
- Psychological attributes like courage, affection, and satisfaction

Hence, a broader understanding of reproductive health, encompassing both biological and psychosocial elements, is essential. Shukra should be viewed as a functional system—not merely an anatomical or pathological entity—consistent with both classical Ayurvedic philosophy and contemporary biomedicine.

REFERENCES

1. Acharya Charaka. *Charaka Samhita*, Chikitsa Sthana 15/16. Edited by Acharya YT. 1st ed. Varanasi: Chaukhambha Orientalia; 2017. p. 517.
2. Acharya Sushruta. *Sushruta Samhita*, Sutra Sthana 15/14. Edited by Kaviraj Ambikadutta Shastri. 16th ed. Varanasi: Chaukhambha Sanskrit Sansthan; 2011. p. 68.
3. Amarasimha. *Amarakosha*, Dhatu Varga. Edited by Vasudev Lakshman Sastri. Delhi: Parimal Publications; 2015. p. 218.
4. Chakrapani Datta. Commentary on *Charaka Samhita*, Chikitsa Sthana 15/18. In: Acharya Charaka. Edited by Acharya YT. Varanasi: Chaukhambha Orientalia; 2017. p. 519.
5. Vagbhata. *Ashtanga Hridaya*, Sharira Sthana 3/63. Edited by Harishastri Paradkar Vaidya. 12th ed. Varanasi: Chaukhambha Orientalia; 2016. p. 402.
6. Acharya Sushruta. *Sushruta Samhita*, Sharira Sthana 9/12. Edited by Kaviraj Ambikadutta Shastri. 16th ed. Varanasi: Chaukhambha Sanskrit Sansthan; 2011. p. 389.
7. Majumdar SS. Stem cell research and its potential in the field of reproductive biology. *J Reprod Health*. 2020;17(3):192–200.
8. Charaka Samhita, Chikitsa Sthana 15/32–33. In: Sharma RK, Dash B, editors. *Charaka Samhita of Agnivesha*. 1st ed. Varanasi: Chaukhambha Sanskrit Series Office; 2014. p. 340.
9. Charaka Samhita, Chikitsa Sthana 15/33. In: Sharma RK, Dash B, editors. *Charaka Samhita of Agnivesha*. 1st ed. Varanasi: Chaukhambha Sanskrit Series Office; 2014. p. 341.
10. Guyton AC, Hall JE. *Textbook of Medical Physiology*. 14th ed. Philadelphia: Elsevier; 2021. p. 650–658.
11. Sushruta Samhita, Sharira Sthana 4/20–21. In: Sastri A, editor. *Sushruta Samhita*. Reprint ed. Varanasi: Chaukhambha Sanskrit Sansthan; 2018. p. 79–80.
12. Chakrapani Datta. *Commentary on Charaka Samhita*. Sutra Sthana 7/20. Varanasi: Chaukhambha Orientalia; 2010. p. 210.
13. Parashara. In: Vaidya J, editor. *Parashara Samhita*. 2nd ed. Mumbai: Krishnadas Academy; 2010. p. 56.
14. Sushruta Samhita, Sharira Sthana 5/15. In: Sastri A, editor. *Sushruta Samhita*. Reprint ed. Varanasi: Chaukhambha Sanskrit Sansthan; 2018. p. 85.
15. Charaka Samhita, Chikitsa Sthana 2/4/46. In: Sharma RK, Dash B, editors. *Charaka Samhita of Agnivesha*. 1st ed. Varanasi: Chaukhambha Sanskrit Series Office; 2014. p. 52.
16. Ganong WF. *Review of Medical Physiology*. 25th ed. New York: McGraw-Hill; 2016. p. 475–485.
17. Charaka Samhita, Chikitsa Sthana 2/4/46–47. In: Sharma RK, Dash B, editors. *Charaka Samhita*. 1st ed. Varanasi: Chaukhambha Sanskrit Series Office; 2014. p. 52–53.
18. Sushruta Samhita, Sharira Sthana 4/20–21. In: Sastri A, editor. *Sushruta Samhita*. Reprint ed. Varanasi: Chaukhambha Sanskrit Sansthan; 2018. p. 79–80.
19. Vagbhata, *Ashtanga Samgraha*, Sharira Sthana 1/6. Varanasi: Chaukhambha Krishnadas Academy; 2017. p. 15.
20. Ganong WF. *Review of Medical Physiology*. 25th ed. New York: McGraw-Hill; 2016. p. 480.
21. Charaka Samhita, Sutra Sthana 17/69. In: Sharma RK, Dash B, editors. *Charaka Samhita*. 1st ed. Varanasi: Chaukhambha Sanskrit Series Office; 2014. p. 98.
22. Sushruta Samhita, Sutra Sthana 5/9 & Chikitsa Sthana 31/7. In: Sastri A, editor. *Sushruta Samhita*. Reprint ed. Varanasi: Chaukhambha Sanskrit Sansthan; 2018. p. 19, 550.
23. Vagbhata, *Ashtanga Hridaya*, Sutra Sthana 11/20; Sharira Sthana 3/63. Varanasi: Chaukhambha Krishnadas Academy; 2017. p. 130, 264.
24. Tiwari PV. *Bhela Samhita*, Sharira Sthana 4. Varanasi: Chaukhambha Visvabharati; 2010. p. 98–100.
25. Shastri S. *Kashyapa Samhita*. 2nd ed. Varanasi: Chaukhambha Sanskrit Sansthan; 2008. p. 215.

26. Tripathi BN. *Madhava Nidana*, Nidana 38/27–29. Varanasi: Chaukhambha Surabharati; 2015. p. 410.
27. Sharma SN. *Yoga Ratnakara*, Purvardha, Vajikarana Adhyaya. Varanasi: Chaukhambha Publications; 2009. p. 291.
28. Mishra B. *Bhava Prakasha Nighantu*, 5th ed. Varanasi: Chaukhambha Bharati Academy; 2013. p. 245.
29. Nieschlag E, Behre HM. *Andrology: Male Reproductive Health and Dysfunction*. Springer; 2010.
30. Sushruta Samhita, Sutra Sthana 15/14. In: Sastri A, editor. *Sushruta Samhita*. Reprint ed. Varanasi: Chaukhambha Sanskrit Sansthan; 2018. p. 65.
31. Vagbhata, *Ashtanga Samgraha*, Sutra Sthana 19/9. Varanasi: Chaukhambha Krishnadas Academy; 2017. p. 220.
32. Vagbhata, *Ashtanga Hridaya*, Sharira Sthana 3/63. Varanasi: Chaukhambha Krishnadas Academy; 2017. p. 264.
33. Goodman & Gilman's: *The Pharmacological Basis of Therapeutics*, 13th ed. New York: McGraw-Hill; 2018. p. 420.
34. Charaka Samhita, Vimana Sthana 8/95. In: Sharma P, editor. *Charaka Samhita*. Varanasi: Chaukhamba Orientalia; 2017. p. 746.
35. Charaka Samhita, Chikitsa Sthana 15/16. In: Sharma P, editor. *Charaka Samhita*. Varanasi: Chaukhamba Orientalia; 2017. p. 526.
36. Ashtanga Sangraha, Sutra Sthana 11/4 and 19/3. In: Tripathi I, editor. *Ashtanga Sangraha*. Varanasi: Chaukhamba Krishnadas Academy; 2021. p. 116, 180.
37. Charaka Samhita, Chikitsa Sthana 30/146. In: Sharma P, editor. *Charaka Samhita*. Varanasi: Chaukhamba Orientalia; 2017. p. 768.
38. Charaka Samhita, Sharira Sthana 2/4. In: Sharma P, editor. *Charaka Samhita*. Varanasi: Chaukhamba Orientalia; 2017. p. 290.
39. Sushruta Samhita, Sutra Sthana 15/5. In: Acharya JT, editor. *Sushruta Samhita*. Varanasi: Chaukhamba Surbharati; 2014. p. 73.
40. Chakrapani on Sushruta Samhita, Sutra Sthana 14/14. In: Acharya JT, editor. *Sushruta Samhita*. Varanasi: Chaukhamba Surbharati Prakashan; 2014. p. 72.
41. Tripathi I, editor. *Ashtanga Samgraha*. Varanasi: Chaukhamba Krishnadas Academy; 2021. Sharira Sthana 1/69. p. 56.
42. Salama N, Gallo MF, Cherala G, Shapiro JS. Female ejaculation and paraurethral glands: a review. *J Sex Med*. 2007;4(6):1551–1558.
43. Dalhana, commentator on *Sushruta Samhita*, Sutra Sthana 15/10. In: Acharya JT, editor. *Sushruta Samhita*. Varanasi: Chaukhamba Surbharati Prakashan; 2014. p. 71.
44. Nieschlag E, Behre HM. *Andrology: Male Reproductive Health and Dysfunction*. 3rd ed. Berlin: Springer; 2010. p. 120–135.
45. Chakrapani on *Sushruta Samhita*, Sutra Sthana 15/8. In: Acharya JT, editor. *Sushruta Samhita*. Varanasi: Chaukhamba Surbharati Prakashan; 2014. p. 70.
46. Dalhana, commentator on *Sushruta Samhita*, Sutra Sthana 15/10. In: Acharya JT, editor. *Sushruta Samhita*. Varanasi: Chaukhamba Surbharati Prakashan; 2014. p. 71.