

A Review Article To Explore The Gaps In The Research Of Ayurvedic Concepts Of Anatomy: Rachanasharir

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Abstract:

Ayurveda has lot to offer to the world of health science. Ayurveda is proving its mettle with the solutions which it provides to various health issues. Research in Ayurveda is also a growing field. Though Ayurveda research is still in its infancy, the Ayurveda scholars are giving their best to reach the standards of international research. Ayurveda people have been contributing in the research area with pharmacological studies, clinical trials etc. Apart from these fields of research, there is a comparatively neglected area, and that is the literary research field. Literary research is to study the basic principle of Ayurveda. Sincere efforts are very essential to study and analyze the ancient text books as it is the base of ayurvedic treatments. Rachanasharir is one of the basic branches of Ayurveda. Many newcomers in the field of Ayurveda don't find research in Rachanasharir very interesting. They don't find much research gaps in this branch. The present study is intended to explore the research gaps in the field of Rachanasharir.

Key words: *Research in Ayurveda, research in Rachanasharir, Rachanasharir, marma, strotas, literary study*

INTRODUCTION:

Research is a continuous process that is going on since old age.^[1] Ayurveda is an ancient Indian medical science which primarily focuses on personalized treatment.^[2] Besides Ayurveda practice, Ayurveda scholars are interested in the field of research also. New age research can take Ayurveda back to its glory. Ayurveda provides promising healthcare in the diseases where modern medical science has limitations. Researchers have proved pharmaceutical use of Ayurvedic herbs. Many Ayurvedic medicines are found to have antioxidant, anti-stress-immunomodulatory, anti-inflammatory properties.^[3] Ayurvedic medicine has been found to be more effective in many diseases.^[4] However, the modern research in Ayurveda is helping modern science itself whereas research should be beneficial for the rejuvenation of Ayurveda and hence the research is not that much fruitful for establishing the basic concepts mentioned in classical texts.^[5]

Three main ancient text books (*Brihat-trayisi.e, CharakSamhita, SushrutaSamhita* and *AshtangaSangraham*) are the main classical texts and form 3 pillars of *Ayurveda*. The basic concepts mentioned in these texts are interpreted with detailed study. An effort initiated by Dr. GopalBasishta (Senior Rheumatologist, USA) on rewriting *CharakSamhita*, with help of several modern technologies puts a bit closer.^[6] More numbers of such initiatives towards researches need to be incorporated, else the salient features of *Ayurveda* will be engulfed by the modern herbalist research.

There is an immense scope for research in the field of *Ayurveda*. Branches like *Rasashastra, Dravyaguna, Agadtantra*, etc are proving it. But quality research needs to be expanded for basic subjects like *Rachana* and *KriyaSharir*.^[7] The best part of literary work done by the eminent scholars of *Ayurveda* is that many ancient text books i.e. the *Samhitas* are translated into English. *Ayurveda* is available in English language for new generations. At the same time, it is available for the global researchers also.

Ayurveda is an evidence based science. The ancient text guides the *Ayurvediya* physicians to examine the patient with various methods. The concepts of evidence collection are based on fourfold parameters that are called as *Pramana*. The four *Pramana* are as follows: (1) *PratyakshaPramana* is the direct observation, (2) *AnumanaPramana* is an inferential evidence, (3) *Aptopadesha* is scriptural evidence and (4) *YuktiPramana* is a planned rational experimental evidence.^[8]

The *Ayurveda* scholars have significantly expanded the area of research. The research in *Ayurveda* can be divided into three basic categories. 1) Research in literature and theory 2) Experimental research and 3) Clinical research.^[9] *Ayurvedic* research is more concentrated towards drug research. The basic principles are the foundation of *Ayurveda* and they seem to be ignored. *Rasashastra, Dravyaguna, Kayachikitsa* have grown well in the field of research.^[10] Other branches like *Kriya Sharira, RachanaSharira, SamhitaSiddhanta* (basic principles) etc. have not set their own landmark inventions yet.

The theoretical *Ayurvediya* researches have not given any noticeable contribution during last fifty years exception being the literary researches that has made classical *Ayurvediya* text available in English for new age readers and researchers. Research in *RachanaSharir* appears to be the most confined in terms of research topics. The most attention seeking topics are *KalaSharir, MarmaSharir, SrotasSharir, SiraDhamaniSharir*, etc.

Marma are the locations where vital energy (*Prana*) is situated.^[11] Several researches are available on *MarmaSharir* (the branch which discuss about the injury to various important locations in the body along with its effects). Most of the studies are theoretical ones.^[12,13] Some studies are focus on validation of *Marma* points with the help of dissection.^[14,15] Very few studies concentrate on clinical aspects^[16] and case studies.^[17] The clinical aspects are studied in retrospective way. Some studies focused on relation between *Marma* and acupuncture and acupressure^[18] and some studies have taken into account the aspect of sports injuries also.^[19] *SandhiMarma* (discussion about the joints that are more prone to injuries) are important for sportspersons particularly^[20-21].

StrotasaSharir is one of the most studied topics in *RachanaSharir*. It includes study of various types of tissues and system of metabolism in the tissues. Each *Strotasa* is a complete system. For example, *AnnavahaStrotasa* is the GIT, *PranavahaStrotasa* is respiratory system. Ongoing studies reveals the importance of *StrotasaSharir*.^[22] The focus of research in *StrotasaSharir* mainly includes Anatomical co-relation of *Mulasthana* (roots) of *Strotasa*, for ex. *RaktavahaStrotasa*.^[23] *AnnavahaStrotasa*,^[24] etc. and pathological correlation of *Strotasa*.^[25] Study of *Mulasthana* of *Strotasas* also form major part in research of *RachanaSharir*.^[26,27] Some of the studies show the role of various *Yogasanapositions* in the management of the diseases related to various *Strotasas*.^[28] Some researchers studied the diseases related to various *Strotasas*. Researchers have contributed a lot in the field of *StrotasaSharir*. In spite of the

good research work, there is a room for work in the areas of *Mamsavaha Strotasa*, *Udakavaha Strotasa*, *Shukravaha Strotasa*.

Kala Shariris another area of interest in *Rachana*. *Kala* are structures lying in between *Dhatus* (tissues) and *Ashayas* (hollow organs). Most of the studies in *Kala Sharir* are based on the structural and physiological correlation of *Kala* and respective tissue.^[29] Also, some studies have tried to review the modern perspective of *Kala Sharir*.^[30] Some researchers have studied *Kala* and the diseases related to it.^[30] Research in *Kala Sharir* is limited mostly to conceptual study.^[32]

There are many areas in *Samhitas* which can be searched and explored for latent content. Researchers of *Rachana Sharir* should now give attention to the unexplored areas of *Samhitas*. The concepts need to be validated and established on the basis of modern parameters.

Discussion:

It is observed from the review of the literature that research in *Rachana Sharir* has been confined to some typical topics. The studies are mostly based on the structures which are described in *Ayurveda* and its correlation with modern anatomical structures. It gives an impression of lack of research topics to the researchers of *Rachana Sharir*. This is a high time when there is a need of paradigm shift in the field of research in *Rachana Sharir*.

Lot of work has been done in anatomical correlation of *Marma*. The *Sadya Pranahara Marmas* which are supposed to be life-threatening, are being treated easily with the help of surgeries. On the other hand, some *Marmas* are still difficult to manage even with the new age advanced medical treatments. Injuries are the main hurdles in the careers of sportspersons. Knowledge of *Marma* could be helpful for prevention of sports injuries. Fresh list of *marmas* can be prepared on the basis of their manageability. *Marma* is called as *Shalya Vishayardha* (half knowledge of surgery) by *Acharya Sushruta*^[33] and hence clinical and surgical approach in the research of *Marma* can validate the significance of the *Marmas*.

Kalais another topic of interest for *Rachana* researchers. The *Kala* are located at various organs and tissues. For example, *Raktadhara Kalais* situated in *Yakrita* (liver), *Pleeha* (spleen) and *Raktavahi Sira* (vessels carrying blood). *Raktadhara Kalais* correlated with endothelial lining of blood vessels, liver and spleen.^[34] Apparently, there is no anatomical relation in these structures but they are grouped together in *Raktadhara Kala*. These organs can be affected by particular diseases where their *Kala* can be a common factor. Same approach of taking the *Kala* into consideration for prognosis and treatment of the diseases can be followed. Drugs like *Lauha Bhasma*, *Tamra Bhasma*, *Manjistha*, *Shatavari*, *Punarnava*, which are used for the diseases of *Rakta Dhātu* can be beneficial for the diseases of *Yakrita*, *Pleeha* or *Raktavahi Sira*s^[35]. Clinical and animal studies may be employed for the studies of all the *Kalas*. Another example can be of *Mamsadhara Kala*, which holds *Sira*, *Snayu*, *Dhamani* and *Strotasas*.^[36] Researchers correlated it with superficial fascia, deep fascia and connective tissue.^[37] These studies are mostly literary studies. The research can be taken forward with clinical or animal study models. Research gaps in *Kala Sharir* can be looked for in this way.

Genetics is a branch of science that deals with the heredity and variations of inherited characters in succeeding generations.^[38] *Ayurveda* has enlisted various factors which lead to congenital diseases and several studies can be found in this area.^[39,40] Genetics is also an area of interest for researchers in *Ayurveda*. Concepts like *Beeja* (gametes), *Beejabhaga* (component of gametes i.e, chromosomes), *Beejbhagavayava* (further finer components of gametes i.e, genes) are mentioned in *Ayurvediya* texts. Number of studies have focused on the *Ayurveda*'s perspective of genetics. Infertility is one of the major health issues currently. Medical science is providing health care to the needy. Number of studies are done on male and female infertility using *Ayurveda* intervention.^[41-43] *Acharya Charaka* has mentioned *Garbhakara Bhavas* (factors that influence the formation of a fetus). *Matrija* (maternal genetic material), *Pitrija* (paternal genetic material), *Aatmaja* (factors that come with soul), *Satmyaja* (factors that influence health due to

good or bad habits), *Rasaja*(nutritional factor)and*Satvaja*(psychological health), these are the six factors that influence the formation of a fetus. These are not only the factors responsible for the formation of a fetus, but also the carriers in organogenesis and other traits to the fetus.^[44]Theabovesaid factors are responsible for the development of specific organs or the structures. These are the concepts *Ayurveda* embryology and it can be studied with various study designs. There is a wide research gap in this field.

Some more topics which can be studied are

1. Instability of pregnancy in the eighth month due to unstable *Oja*.^[45]
2. *Ayurvediya* concepts of organogenesis during embryonic period.^[46]
3. *Ayurveda* advocate the process of *Punsavan karma*(administration of medicine for healthy progeny) and *Garbhiniparicharya*(regimen to be followed during antenatal period to ensure better growth and development of the foetus) during pregnancy. Effect of *Punsavan karma* and *Garbhiniparicharya* on the growth and development of the foetus can be studied with prospective studies.^[47]
4. Research area in the area of musculoskeletal system:
 - i. Total number of *snayu*(ligaments)(900)^[48] and types of *Snayu* (*Pratanvati*(aponeurosis), *Vrutta*(tendon), *Pruthu*(big tendons) and *Sushira*(hollow tube of GIT)^[49] mentioned by *Acharya Sushruta* and its study with respect to histology of co-related tissue.
 - ii. *Jalawhich* literally means network^[50] also mentioned in *Samhitas* is the area of research gap.

Previous and ongoing researches help to find out the gaps in the research. Few of the related studies on concepts of *Ayurveda* were reported^[51-53]. Validation of the structures that are mentioned in *Samhitas*, can be the research area of priority. A perfect study design with valid objective parameters is the key for a good research^[54-55].

REFERENCES:

1. Vaibhav Dadu. Research in *Ayurveda*: need, scope & utility. *Journal of Diseases and Medicinal Plants* 2017;3:6-9.
2. Thakar A. *Ayurveda* research: The present status and prospects. *AYU* 2018;39:1.
3. Sathya N. Dornala and Snehalatha Sn Dornala. Scope of *Ayurveda* in Integrative Oncology. *Annals of Ayurvedic Medicine* 2012;1:158-65.
4. Chauhan, Ashutosh & Semwal, Deepak & Mishra, Satyendra & Semwal, Ruchi. *Ayurvedic* research and methodology: Present status and future strategies. *AYU* 2015;15:364-69.
5. Balogun, S., Osuh, J., & Onibokun, O. Effects of Separate and Combined Chronic Ingestion of Codeine and Tramadol on Feeding Behaviour of Female Albino Rats. *Journal of Medical Research and Health Sciences*, (2020), 3(7). <https://doi.org/10.15520/jmrhs.v6i7.220>
6. Singh, Ram Harsh. Exploring larger evidence-base for contemporary *Ayurveda*. *International journal of Ayurveda research* 2010;1:65-6.
7. Chandola, Harimohan. New challenges for *Ayurveda*: How it will stand?. *Ayu* 2012;33:165-6.
8. Chandola, H. M. Nourishing the tree of *Ayurveda*: enriched with Specialty. *Ayu* 2011;32:443-4. <https://doi.org/10.4103/0974-8520.96111>
9. Bhalerao S, Ranade A, Vaidya AD. Bloom's taxonomy reiterates *Pramana*. *Journal of Ayurveda and integrative medicine* 2017;8:56-7. <https://doi.org/10.1016/j.jaim.2017.01.002>.
10. Mohammed, ebtahag. “ Explanatory Factor analysis to determining the risk factors of cardiovascular disease. *Journal of Medical Research and Health Sciences*, (2020), 3(8). <https://doi.org/10.15520/jmrhs.v3i8.228>
11. Vaidya, Ashok D. B. An advocacy for vaidya-scientists in *Ayurvedic* research. *Journal of Ayurveda and Integrative Medicine* 2010;1:6-8. <https://doi.org/10.4103/0975-9476.59818>.
12. Thakar, Anup. *Ayurveda* research: the present Status and prospects. *Ayu* 2018;39:1. https://doi.org/10.4103/ayu.AYU_269_18.
13. Achary YT, editor. *Nibandhasangraha* commentary. 1st ed. Varanasi, Uttar Pradesh, India: Chaukhambha Surabharati Publication; 1994. *Sushruta, Sushruta Samhita*, with Dalhan; p. 288.

14. Sawarkar, Gaurav. Conceptual study of gudamarma with special reference to RachanaSharir. *Ayurveda And All* 2013;0:20-22.
15. Rani, Sona, Sunil Kumar Yadav, Nishi Jain. Anatomical interpretation of UrdhvaShakhagataSnayuMarma and its clinical importance. *World Journal Of Pharmaceutical Research* 2017;6:386-97.
16. Sawarkar GR, Desai P, Chouragade B, Sawarkar P. Anatomical study of SandhiMarma with special reference to KurparSandhi. *Joinsysmed* 2017;5:66-70.
17. Thakur Sudarshan K., TakAnjna, Bajaj Nisha (2018) NavayasLauh; Justification to use as Primary medicine for treating Anaemia; Under “Anaemia control Programme through Ayurveda” *International Journal Of Scientific Research And Education*. 06,02 (Feb-18) 7858-69
18. Sonune, AmitMuktaji, Geetanjali S. Karle, B. C. Vikhe, P. P. Pande. Observational study of ManibandhaMarma and its location with special reference to wrist pain. *World Journal Of Pharmaceutical Research* 2016;6:694-706.
19. Muley, S and Ingale, N and Bhingare, S. Study of VaikalyakaraMarma with special reference to KurparaMarma. *AYU* 2011;32:472-7.
20. Madavi, Nitin& Desai, Priti&Iratwar, Sandeep. Validation of Traumatic Effect on VidhurMarma through Modern Parameters-A Case Study. *International Journal of Medical Science and Innovative Research* 2017;2:158-63.
21. Rathod DG, Vaikos CD, Deshpande PR. Comparative study of clinical significance of Marma (vital points in Ayurveda) in hands, acupuncture and acupressure- a review. *Indian Journal Of Pharmaceutical Sciences* 2016;3:18-22.
22. Giri, Deepali M., Mitali R. Dabhade. A review article on ManibandhaMarma with reference to basic anatomy and biomechanics of the wrist. *Journal of Indian System of Medicine* 2020;12:103-9.
23. Susmita S, Shilpi G, Kirandeep K, PrachiSaffar A. Anatomy of ofSuprascapular Notch among North Indian Dry Scapulae: A Morphological Evaluation. *Int J Cur Res Rev*. Vol 12 Issue 22, November, 2020, 132-138.
24. Prathap Kumar J., Arun Kumar M., VenkateshD.. Healthy Gait: Review of Anatomy and Physiology of Knee Joint *International Journal of Current Research and Review*. Vol 12 Issue 06, March, 01-08
25. Rani, Dr. Sona et al. Comprehensive review of srotas in Ayurveda and its importance in Sharir. *World Journal Of Pharmaceutical Research* 2018;7:626-35.
26. Moujkar RD, Patil SC, Jagtap AD. Anatomical concept of RaktavahaSrotasMoolasthan. *International Journal of Research in Indian Medicine* 2019;3. <http://www.ayurline.in/index.php/ayurline/article/view/260>
27. Saini, Dr. Physio-anatomical exploration of AnnavahaSrotusw.s.r. to Moolasthan. *World Journal of Pharmacy and Pharmaceutical Sciences* 2017;427-33.
28. Shrinidhi Kumar Acharya: Pathological understanding of PranavahaSrotas. *ayurpub* 2016;1:185-91.
29. Sawarkar, Gaurav. Critical appraisal of Srotosa with special reference to its Moolsthana. *Research Journal of Holistic Health Management* 2016;08:121-26.
30. SubodhVerma et al: A conceptual study of Srotas and their Moolasthanāna. *International Ayurvedic Medical Journal* 2019;7:59-64. http://www.iamj.in/posts/images/upload/59_64.pdf
31. Dr. Rajni K. Gurmule, Dr. Priti Desai, Dr. PremkumarBadwaik. Study of effect of SiddhasanadiAsanas on range of motion of hip joint on healthy volunteers. *Journal of Critical Reviews* 2020;6:842-46.
32. Dr. RadhaAndhare. Conceptual study of Pittadhara Kala in correlation with cell membrane. *International Journal of Science and Research* 2019;8:670-72. https://www.ijsr.net/search_index_results_paperid.php?id=ART2020128

33. Desai, Priti. 'A modern perspective towards interpretation of "pittadharasaevamajjadharaiti"', 43–50, 2019.
34. Khedikar, Sachin. Study of Raktadhara Kala with special reference to atherosclerosis. Research Journal of Holistic Health Management 2017;8:287-90.
35. JadhaoSanjivani. Conceptual Study of Kala Shareerw.s.r. to Shukradhara Kala A Sarvashareervyapee. International *Ayurvedic* Medical Journal 2018;3:1458-61. http://www.iamj.in/posts/images/upload/1458_1461.pdf
36. Mishra A, Shrivastava V. Exploring the science of marma-an ancient healing technique-part 2: definition and properties of marma.2020.
37. Giri, Deepali M and Chouragade, Namrata B. A critical analysis of Raktadhara Kala in perspective of AcharyaSushrut. Journal of Indian System of Medicine 2019;7:28.
38. S.Madhulika Et Al. Dravyas acting on Rakta- A review. International *Ayurvedic* Medical Journal 2017;5:1217-23. http://www.iamj.in/posts/images/upload/1217_1223.pdf
39. Sawarkar, Gaurav, and PunamSawarkar. 'Critical appraisal of mamsadharakala', 1–12, 2019.
40. WaghmareAshwinikumar, BhosgikarAnup, NiyazahmedKanavi. Critical study of Mamsadhara Kala. Journal of Ayurveda and Integrated Medical Sciences 2017;6:107-09. <http://dx.doi.org/10.21760/jaims.v2i06.10932>
41. HarkiranNehra. Ayurveda, genetics and genomics: An integrative approach to traditional and basic sciences. International *Ayurvedic* Medical Journal 2017;1:95-9. http://www.iamj.in/posts/images/upload/295_299.pdf
42. Dhiman, Kamini and Kumar, Abhimanayu and Dhiman, Kartar. Shad GarbhakaraBhavasvis-avis congenital and genetic disorders. AYU 2010;31:175-84.
43. Dr. SwapnilS.Patil, Dr. R. B. Patil, Dr. Smita V. Lokhande. Genetic disorders a bird view. International Journal of Innovative Research in Medical Science 2017;2:1130-2. <http://ijirms.in/index.php>
44. Gaurav Gaur et al. Female infertility: An overview. International *Ayurvedic* Medical Journal 2018;6:897-902. http://www.iamj.in/posts/images/upload/897_902.pdf
45. Oberoi, Avneet and Pr, Lal and Rishi, Priti. *Ayurvedic* concepts of female fertility-A review. International Journal of *Ayurvedic* and Herbal Medicine 2016;6:2313-20.
46. ParvatiBiradar, MahantagoudaBiradar, M. Srinivasulu. Genetics of Ayurveda in infertility. Journal of Ayurveda and Integrated Medical Sciences 2017;2:181-5. <http://dx.doi.org/10.21760/jaims.v2i4.9349>
47. Fulzele VC, Golghate RK, Nagdeve PA. Conceptual study on the congenital and genetic anomalies w.s.r. to Shad GarbhakaraBhavas. Ayurlog: National Journal of Research in Ayurved Science 2017;5:1-10. <https://www.ayurlog.com/index.php/ayurlog/article/view/8>
48. Sushruta, SushrutSamhita part II, Sharirasthan, GarbhavakrantiShariram, 3/30 1st edi, Dr. KevalkrishnaThakaral, translator. ChaukhambaOrientalia, Varanasi. Reprint 2017;47.
49. Sushruta, SushrutSamhita part II, Sharirasthan, GarbhavakrantiShariram, 4/25 1st edi, Dr. KevalkrishnaThakaral, translator. ChaukhambaOrientalia, Varanasi. Reprint 2017;57.
50. Agrawal, T., & Gupta, P. K. Garbhasanskar–A boon to get suprajya. The Pharma Innovation Journal 2018;7:454-6.

51. Sushutra, AmbikaDuttaShastri, SushutraSamhita with Elaborated Ayurveda TatvaSandipika Hindi Commentary, Reprint 2009. Varanasi: Choukhambha Sanskrit Sansthan, Volume 1, SharirSthan Chapter 5 Verse34-37. Page 38
52. Sushutra, AmbikaDuttaShastri, SushutraSamhita with Elaborated Ayurveda TatvaSandipika Hindi Commentary, Reprint 2009. Varanasi: Choukhambha Sanskrit Sansthan, Volume 1, SharirSthan Chapter 5 Verse38-40. Page 62
53. Manhas, S., Lakra, S., Mehak, Sharma, A., Garg, K., & Arora, G. (2020). Apex Locator - Booster to Dentist : Literature Review. *Journal of Current Medical Research and Opinion*, 3(07), 508-515. <https://doi.org/10.15520/jcmro.v3i07.308>
54. LakhiprovaDoley et al. An analytical study of musculoskeletal component in Ayurveda: A review. *International Journal of Research in Ayurved& Pharmacy* 2017;8:43-7. <http://dx.doi.org/10.7897/2277-4343.086289>.
55. Roy, M., B.R. Singh, U.L. Gajbe, and P. Thute. "Anatomical Variations of Ureter in Central India: A Cadaveric Study." *Journal of DattaMeghe Institute of Medical Sciences University* 12, no. 4 (2017): 277–79. https://doi.org/10.4103/jdmimsu.jdmimsu_73_17.
56. Rathi, B., and R. Rathi. "Principals of Ethical Ayurveda Prescription Writing in Clinical Practice: A Literature Review." *Journal of DattaMeghe Institute of Medical Sciences University* 14, no. 6 (2019): S97–102. https://doi.org/10.4103/jdmimsu.jdmimsu_213_19.
57. Wajpeyi, S.D.M. "Concept of Bioethics in Ayurveda." *Journal of DattaMeghe Institute of Medical Sciences University* 14, no. 6 (2019): S107–9. https://doi.org/10.4103/jdmimsu.jdmimsu_204_19.