

A CRITICAL REVIEW STUDY ON DISSECTION TECHNIQUES IN ANCIENT INDIAN ANATOMY IN CONTEXT TO ITS CLINICAL SIGNIFICANCE

^{1*}Dr. Lahange Sandeep Madhukar, ²Dr. Vikash Bhatnagar, ³Dr. Bhangare Archana Nivrutti,
⁴Dr. Shailza Bhatnagar

^{1,3}Assistant Professor, P. G. Department of Sharir Rachana Nia, Jaipur 302002.

²Assistant Professor, Deptt. of Kayachikitsa, P. G. Ayurvedic College Mandi Govindgarh (Pb.)

⁴Assistant Professor, P. G. Department of *Maulik Siddhant* Nia, Jaipur 302002.

*Corresponding Author: Dr. Lahange Sandeep Madhukar

Assistant Professor, P. G. Department of Sharir Rachana Nia, Jaipur 302002.

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ABSTRACT

Anatomy is broadly appreciated as being one of the cornerstones of medical education. Learning anatomy through the dissected cadaver is viewed as the uniquely defining feature of medical courses. Explosion of knowledge in the field of medicine was feasible only due to exploration of human body through human cadaver dissection. Sages of ancient India are still relevant as they not only gave the vision of happy social and personal life, with great sense of ecological balance but they also discovered many scientific facts and truth about human body. Such discoveries formed the basis of many sciences of present era. In this topic we will discuss specifically about the dissection techniques in ancient Indian anatomy which were described in very scientific manner by the acharya sushruta. *Āyurveda* has described in detail the dissection methodology, nomenclature of human anatomy and clinical anatomy as well. *Āyurveda* provide the evidence of existence of knowledge of anatomy before the announcement of modern anatomy. *Ayurvedic Acharya* described the various terms and concepts regarding the human anatomy in the *Samhita*. Till date, very little is known to the western world about the profound description of the subject present in ancient texts of Indian medicine. The present research article is taken to show eternity of our ancient science.

KEYWORDS: *Ayurveda*, Ancient Anatomy, dissection, human anatomy *Sharir Rachana*, *Samhita*.

INTRODUCTION

Anatomy refers to the science of investigating the body's internal structures. There have always been specialists on the body's interior; hunters were among these specialists in man's early history. Animals killed during the hunt had to be gutted and the meat had to be removed from the bones; a certain understanding of anatomy was an advantage in this regard. 'Kitchen anatomy' therefore concerned the anatomy of animals. Initial interest in human anatomy most probably arose among cannibals, whose motives were primarily ritual in nature. They believed that by consuming their enemies they could absorb their strength.

In the earliest advanced civilizations, procedures were developed for immortalizing the bodies of the dead - at least when the deceased had been persons of importance. Preserving entire corpses in this way was known in many cultures. The most famous instance is that of the mummies of ancient Egyptian pharaohs and other dignitaries, whose gutted bodies had been treated with fragrant resins and sodium bicarbonate and then dried; this was to allow the deceased to live on after death. At

its high point in South America, mummification even led to the establishment of entire cities of the dead. Ritual anatomy did not achieve any great anatomical insights, however, because the focus of preservation efforts was the mortal shell of the person, the skin in particular. The major impetus for acquiring detailed anatomical knowledge has always come from medicine. At first, this knowledge lay in the hands of shamans and priests; shortly before the beginning of the Common Era (A.D.), the profession of physician came into being, a vocation for which training was largely of philosophical nature.

Acharya Sushruta (2000 B.C.), known as father of ancient anatomy and surgery, made a pioneer text of anatomy and surgery in which he has been described the significance of anatomy that without exact knowledge of make of the things nobody can repair that likewise without the keen knowledge of anatomy of human body, neither physician nor the surgeon shall do the best. The physician, without knowledge of anatomy can neither understand the site of disease nor can select the appropriate medicine for that. In the same way without knowledge of anatomy, the surgeon neither can locate

the site of diseased organ nor the way of approach as well as what the structures shall meet in way and what shall be the effect of ignoring them. Means, by knowing the anatomy of body, one attains to knowledge of all those things which are productive of benefits to the body. For this reason, physicians possessed of skill applaud knowledge of the anatomy of the body. Branches related to surgical procedure are based on the keen knowledge of *Rachana Sharir* (Anatomy), because anatomy is the only field which gives us the knowledge of structure of body from cellular to organ level by which we understand the structures behind the part being operated or examined.

History of Indian anatomy

Anatomy is the oldest and the most important of all medical sciences. There is enough evidence of practice of this science in the ancient India. Here evidence is presented to show that the Indians were the first scientific cultivators of the most important and essential department of medical knowledge namely practical anatomy.

Pre-Vedic period

Five thousand years ago, around 3000 BC Indus valley civilization flourished on the banks of the river Indus, contemporaneous with Mesopotamian civilization. Medicine was practiced by priests, who were considered next only to kings and the practice itself was a mixture of magic, rites and rituals. Archaeological excavations from this ancient period show clear evidence of knowledge of comparative anatomy. There are cave paintings depicting pictures of animals on which the critical areas are marked. These areas when hit would have killed the animals. So, here in lie the evidences of the first ever lessons in surface anatomy.

Vedic period

Around 1500 BC northern India was invaded by Indo-European tribes such as the Aryans and that led to the start of Vedic period. *Srila Vyāsadeva* also known as *Vedavyāsa* rendered the four *Vedas Rig, Yajur, Sāma* and *Atharva Vedas* to his disciples. The *Rigveda* mentions the heart, lungs, stomach and kidneys. The *Atharva Veda* lists medicinal herbs, plants and also mentions “the wonderful structure of man”. The *Atharva Veda* refers to heart as “Lotus with nine gates” an amazingly accurate description of the heart as we know it today. We know that the heart indeed looks like a lotus bud if held with its apex upwards and there are nine openings in all three in the right atrium, four in the left atrium and one each in the right and left ventricles. The *Atharva Veda* refers to “*Dhamanīs*” which are ducts with thick walls equivalent to arteries; “*Sirās*” which are ducts with thin walls equivalent to veins and still finer ducts are referred to as “*Snavas*” similar to capillaries.

The *Vedas* were followed by other writings. The ‘*Brāhmanas*’ which can be considered as guide books for the *Vedas*, came next. ‘*Āranyakas*’ and then ‘*Upaniṣads*’ followed *Brāhmanas*. *Upaniṣads* contain knowledge

acquired sitting around one teacher in the “*Guru Śiṣya* tradition” where the disciples sit around the teacher and learn. One of such called *Garbha Upaniṣad* (1400BC) describes the development of embryo in an astonishingly precise manner. “From the conjugation of blood and semen the embryo comes into existence. During the period favourable for conception after the sexual intercourse it becomes a ‘*Kalala*’ (one day old embryo). After remaining seven nights it becomes a vesicle ‘*Budbuda*’. After a fortnight it becomes a spherical mass “*Pinda*”. After a month it becomes a firm mass. After two months the head is formed. After three months the limb regions appear. Similar descriptions are also found in the teachings of *Vāgbhatta*, *Viśnudhāra* and in *Agni Purāna*. This accurate description of the embryo in the *Upaniṣad*, which predated microscopes, is truly amazing as it matches almost accurately with the present day knowledge of embryology. Seven days old embryo is indeed vesicular and is called blastocyst. The description of formation of the head and the limb regions also more or less matches with the time of their development as we know them today.

Post-Vedic period (*Samhitā Kāla*)

The post *Upaniṣad* period from 800B.C. to 1000A.D. may be considered the “The Golden Age of Indian Medicine”. *Āyurveda*, the science of life evolved during this period and two great proponents of this science existed and practiced medicine in India *Suśruta* and *Caraka*. The first written evidence of *Āyurveda* is in the Sanskrit writings of *Caraka Samhitā* and *Suśruta Samhitā*. These two manuscripts form the twin pillars of *Āyurveda*. Both these *Samhitā* devote a complete section “*Śarīra sthāna*” to the subject of anatomy. In these sections besides gross anatomy, embryology and histology are also dealt with which indicate a comprehensive study of Anatomy. Naturally the histological features described before the advent of the microscopes were mainly speculative. During this period the ancient Indians also pioneered in human dissection. Indian anatomist were aware that in order to attain a satisfactory knowledge of human anatomy one had to take recourse to dissection and it was practiced in ancient India as is mentioned in *Suśruta Samhitā*: “Anyone who wishes to acquire a thorough knowledge of anatomy must prepare a dead body and carefully observe and examine all its different parts. One should select a body, which is complete in all its parts. Having removed all the excrementitious matter from it, the body should be wrapped in grass and placed in a cage. Having firmly secured the latter in a hidden spot in a river, the body should be allowed to decompose. After an interval of seven days, the thoroughly decomposed body should be taken out and very slowly scrubbed with a whisk made of grass roots (of *kuśa*). At the same time every part of the body great or small; external or internal, beginning with the skin should be examined with the eye.”

Since the Indian anatomists were forbidden by tradition and religious beliefs to cut the body, it was only natural

for them to use *Kuśa* grass to peel off the layers of the skin and study the interiors. These early Indian anatomists divided the body into six parts the four extremities, the neck and the trunk. The emphasis in Indian anatomy was given first to the bones and then to the muscles, ligaments and then joints. Ancient Indian Anatomists belongings to *Ātreya Caraka* School counted 360 bones and those of *Suśruta's* school noted 300 bones in the human body. They included teeth, nails, cartilages, the bony prominences and protuberances as separate bones, a fact that accounts for the large number they got.

Although *Caraka's* knowledge of the muscles was very rudimentary, he gives the number of muscles of the body as 500. *Suśruta* not only gives the total number of muscles but their distribution as well stating that of the 500 muscles 400 are in the four extremities, 66 in the trunk and 34 in the region above the clavicles. With references to the heart and the vessels, *Caraka* does not add much to what is given in *Atharva Veda* but gives the number of *Dhamanīs* as 200 and that of *Sirās* as 700. *Suśruta* describes the '*Dhamanīs*' and '*Sirās*' as having their origin in the umbilicus. He also describes "*Rasa*" as flowing through these ducts. Beside "*Dhamanīs*" and "*Sirās*" *Suśruta* also mentions "*Srotas*" numbering 22. As far as the nervous system is concerned, very little is said about the brain in Indian medical literature. *Bhela*, author of *Bhela Samhitā* recognized the brain and considered it as the centre of the '*Manas*'. *Suśruta* was aware of at least four pairs of cranial nerves one "*Nilā*" and one "*Manyā*" situated on either side of larynx which when injured produced loss or change of voice (hoarseness); one pair of "*Vidhura*" behind the ears which when cut produced deafness; a pair of "*Phaṇa*" inside the nose, destruction of which produced loss of smell and a pair of "*Apāṅga*" below the eyes which if cut would produce blindness.

Caraka and *Suśruta* also described the viscera. *Caraka* uses the word "*Kloma*" and *Suśruta* uses the word "*Phuṣṭhūsa*" for the lungs but both refers to the lungs in singular. Both *Caraka* and *Suśruta* were acquainted with the stomach and intestine. *Suśruta* called the rectum "*Gudam*" and stated its length. He also describes its interior as having three spiral grooves. *Suśruta* also describes the urinary bladder, uterus (*garbhāsaya*) and vas deferens. The shape of the uterus is linked to the mouth of *Rohit* fish. *Suśruta Samhitā* also describes "*Marmas*" which are the meeting places of any two or more of the elements of the body "*Māmsa*" flesh or muscles, "*Sirā*" vessels, "*Snāyu*" ligaments, "*Asthī*" bones and "*Sandhi*" joints. The effects of injury to these "*Marmas*" have also been described. Injury to "*Gulpha Marma*" at the junction of foot and calf would result in pain, paralysis and lameness. Injury to "*Indrabasti Marma*" which is 12 to 13 finger breadths above ankle, in the middle of the calf can cause excessive haemorrhage and even death. "*Jānu Marma*" at the junction of thigh and knee, when injured would result in

lameness. "*Vitapa Marma*" at the junction of scrotum and inguinal region, if injured would cause impotency.

Suśruta aptly called as "The father of Surgery" can easily be also named as "The father of applied anatomy". As noted above, the knowledge of the structure of the body gained through dissection and later surgery was applied to various clinical conditions and the Anatomico-clinico-pathologic correlation was used well in the practice of medicine and surgery. The art and science of medicine was being taught during this time in the great university towns of Nālanda, Taxila and Varanasi (Banaras).

Modern period

The medical education in India revived with the arrival of the British (1600 A.D.) and the colonisation of India. Medical schools were established in the late 19th century in the metropolitan towns of Madras, Calcutta and Bombay. Madras medical school began its operations in 1835. Dr. Mortimer of that school used to teach the native apprentices/pupils, muscles and bones from pasteboard models. This led to the framing of an early text book in practical anatomy "Mortimer's Manual of Anatomy." This manual precedes "Cunningham's Manual of practical Anatomy". In pre-independent India, Britishers used to dominate the faculty in these medical schools and professorial posts were manned by officers of Indian Medical Service (IMS). With a lot of reluctance a few nonclinical professorial posts were opened to non IMS Indians and Dr. Y. G. Nadgir was the first to be appointed to a chair in Anatomy at the Grant Medical College, Mumbai. It took almost four decades for the number of Indian anatomists on the faculty to grow from one to one dozen. Now all the medical colleges in India have a full-fledged department of anatomy where even today manual dissection is done and taught with a lot of fervor, even as virtual dissection in computers is possible.

Lack of uniformity in the standards of teaching anatomy in different institutions gave the impetus to start a common platform to discuss and decide the academic aspects. Thus was born "Anatomical Society of India" ASI on 20th may 1951. It was ceremonially inaugurated in the Medical College of Calcutta, where Dr. A. A. Ayer of Madras was elected as the first president. The main objective of the society was the advancement of the study of and research in Anatomy. It was also decided to bring out a journal under the aegis of the society. Thus in India the science of Anatomy has valiantly climbed the steps of time having been taught and practiced from the Pre-Vedic period to the present era of online education on computers and it is sure to go on and achieve greater strides in future.

DISCUSSION

The eminent persons of Ayurveda recognized the value of knowledge related to human body and thus incorporated a separate section in their manuscripts. It is evidently proved that *Acharya Sushruta* in *Sushruta*

Samhita described the *Shavacchedana* process first time in a much disciplined way and advocated that to enhance the knowledge; one should study deeply the texts as well as gain the practical knowledge of the content. *Acharya Charak* focused on the importance of anatomy by saying that knowing the anatomy of body; one attains the knowledge of all those things which are productive of benefits to the body. For this reason, physicians possessed of skill applaud knowledge of the anatomy of the body. *Ayurveda* is written in *Sanskrit* language and in the *Devanagari* script having unique nuances and complex shades of meanings which is not in vogue now a day. With the globalization, most of the *Ayurveda* texts were translated in various languages but a lot of terms in *Ayurveda* are still unexplained. In present era from 18th century AD learned people of western world realised the significance of conspicuous knowledge of human body as *Charak* and *Sushruta* said. Then the science of anatomy emerged and through many conferences anatomists had established the concrete floor of universally applicable terminologies. It was a very hard task to collect the words related to *Sharir Rachana* from Major *Ayurveda Samhita* because as in other terminology terms have their unique meaning and indications, the *Ayurveda* terminology carries different connotations of the same words with their context while word meaning in *Sanskrit* is different. Different *Samhita* were written in different geographical regions of India in ancient era of human civilization offers a very huge vocabulary of *Sanskrit* which shows its richness but also creates a big problem for a researcher who tried to explore the terms related to *Sharir Rachana*. The principles of diagnosis and treatment in *Ayurveda* need the exploration and they are definitely based on *Shaarir*. There are many *Shaarir* terms commonly used in society and they easily express their meaning and structure but a lot of them are purely of *Chikitsa Shastra* and need their exploration. There are various terms which have used in a very peculiar way for a particular structure or process though they meant the absolutely different in literature, called as *Swasangya*. Unexplored terms obscure the better understanding of the subject to the students as well as become an obstacle in the way of globalization. For example in the *Ayurvedic Rachana Sharir Apalap, Kloma, Krikatika, Tilak, Unduka* etc. are the words which need their better understanding.

In present, Anatomy is broadly appreciated as being one of the cornerstones of medical education. Learning anatomy through the dissected cadaver is viewed as the uniquely defining feature of medical courses. Explosion of knowledge in the field of medicine was feasible only due to exploration of human body through human cadaver dissection. Present era people have assumed that the surgery is the right of modern medical science because of their keen knowledge of anatomy, modern instruments, latest technique and technology along with anesthetic drugs. Due to no exploration of ancient knowledge on modern parameters the personnel of traditional medicine systems are going to be defeated.

This article was a step in way of exploration. *Sushruta Samhita* is the pioneer text of *Ayurvediya* anatomy and surgery written by *Acharya Sushruta* has described various terms and concepts regarding human body. When we have referred lots of *Ayurvediya* texts and their commentary, *Vedic* literature, *Brahman* and *Samhita granthas* and various *hindi* English *sanskrit* dictionaries to discover more evidences, sutras, words and their meaning.

CONCLUSION

History of Indian anatomy has been started from approximately 1500 BC when northern India was invaded by Indo-European tribes such as the Aryans and i.e. from Vedic period. Anatomy is the oldest and the most important of all medical sciences. There is enough evidence of practice of this science in the ancient India. The Indians were the first scientific cultivators of the most important and essential department of medical knowledge namely practical anatomy. Ancient Indian anatomy is the oldest source of knowledge of human anatomy. It has very significant and efficient history in which various terms and concepts regarding the human anatomy has been described. Presently, the knowledge of Indian anatomy available in *Ayurveda Samhita* is very fewer, dispute and in scattered form.

Anatomical knowledge in ancient India was derived primordially from animal sacrifice, chance observations of offensively buried human bodies and examinations of patients made by doctors during treatment. The *Vedic* philosophies form the basis of the *Āyurvedic* tradition, which is considered to be one of the oldest known systems of medicine. Significance of ancient India is still relevant as they not only gave the vision of happy social and personal life, with great sense of ecological balance but they also discovered many scientific facts and truth about human body. Such discoveries formed the basis of many sciences of present era and also the facts and concepts of modern human anatomy were already described in ancient Indian anatomy in very scientific manner by the seers of *Āyurveda*.

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