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A COMPARATIVE TEACHING METHODOLOGY OF RACHANA SHARIR (HUMAN ANATOMY) BETWEEN ANCIENT TIME AND PRESENT TIME

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ABSTRACT

Ayurveda, the science of life which deals with the care of physical, mental and spiritual well-being. Thousands of years ago from Vedic period an individual has its origin. Among the four Vedas, Atharva Veda contributes more to Ayurveda. Ayurveda is also considered as fifth Veda or Upaveda. According to modern system of medicine, Gray's Anatomy is the anatomical basis of medicine and surgery. But in fact, the ancient system of Indian medicine Ayurveda has described the detail dissection methodology, nomenclature of human anatomy, clinical anatomy, analogy, method of teaching anatomy which is preliminary for dissection as well. Sushruta is called as the father of surgery, but if we undergo the Ayurveda books, principals of Sharir Rachana (human anatomy) are very specifically mentioned by Sushruta, so Sushruta should also called as the father of human anatomy. Studying anatomy by the dissected cadaver is observed as the uniquely explain property of medical courses. Explosion of knowledge in the area of medicine was suitable due to examination of human body by human cadaver dissection. Acharya Sushruta was a strong promoter of human dissection as confirm from his Samhita. Systematic procedure for the dissection of the human dead body (cadaver) is included by him in his books. Sushruta is called as the father of surgery in present era also, but Sushruta should also call as the father of human anatomy because he described the essentials of human anatomy very precisely. In this context we will study about a comparison of teaching methodology of ancient era and present era.

KEYWORDS: Ayurveda, the science of life which deals with the care of physical, mental and spiritual well-being.

INTRODUCTION

Sushruta Samhita is the first and the most authentic text of Ayurveda in the specialty of Shalya Tantra (Surgery). Ayurveda is divided into these eight branches for better understanding of the subject and basic concepts. So Acharya Sushruta focuses on both theoretical knowledge and practical application of the same. Today, the teacher of Ayurveda is awaited not only to be well trained in the theoretical books but also in practical concepts. There are several methods of teaching available but the main objective must be the method selected by the teachers and it should enable the students to learn. In ancient times the main method of teaching was by Shavavicchedana (Dissection) prior to which understanding the anatomy is must and hence the teaching methodology adopted by Acharya Susruta is analysed. With the time gone, there are also various teaching methods to study Rachana sharir. Furthermore, Covid-19 pandemic with the widespread application of self-isolation guidelines and social distancing. It is not clearly reasonable for teachers and students to attend lessons or assessments and an urgent need for many institutions to quickly implement an alternative educational and assessment methods.[1] In this we will study the comparison of present and ancient teaching method and which teaching method is more appropriate for Rachana Sharir (Anatomy) Students by showing a statistical data.

ANCIENT TEACHING METHODOLOGY

Gurukul- In the ancient time the learners or disciples used to stay with the Acharya in Gurukula and spend maximum time to get entire knowledge of the subject, this teaching and learning methodology is called “Guru Shishya Parampara”, which is mentioned in the ancient text of Ayurveda. A “Gurukula” was a place where a teacher or “Guru” lived with his family and trained the students. The Gurukula system of education suffered a setback during the medieval and colonial periods of Indian history. On the basis of “Guru Shishya Parampara” Acharya gave maximum time to their disciples for explaining the subject and solving subject related doubts hence disciples are at the centre of learning procedure, with a range of sources in hand to be used as required. This learning procedure is having three parts.

(1) Adhyayan -In this part disciples were informed about the topic of next class and they were advised for the source of knowledge to prepare for the next.

(2) Adhyapan- In this part the topic was described completely and the topic related doubts were solved in the class.

(3) Sambhasha- In this part group discussion occurred between all disciples actively.

Board and chalk method

"Black color is sentimentally bad but, every black board makes the students life bright." -- Dr. A.P.J. Abdul Kalam Sir. Board and chalk method is the classical and the most common method used for teaching anatomy. During lecture the important sentences and keywords are noted down and necessary diagrams are also drawn on the blackboard. This teaching method is only applicable during the lecture. Today power point presentation is also listed under the traditional method. It attracts the listeners compare to the chalk and board method and makes them more active in listening. Color of the ppt is more important because it can drag attention making students to listen attentively. The diagrams in the ppt can be clearly seen than the chalk method.

Lecture method– Lecture has been the most universal form of teaching since prehistoric time. The word lecture dates from 14th century and was derived from latin word –"lectus", which means "to read". Lecture is defined as an oral discussion on a given subject before an audience for purpose of instruction and learning. This method of teaching is criticized for being unidirectional method of communication that does not involve significant audience participation. Didactic lectures are still most commonly used methodology of teaching by faculty of medicine. A lecture is a talk or verbal presentation given by a lecturer, trainer or speaker to an audience. With all the upgradation of training systems and computer technology, lecture method is still a backbone generally used in teaching and training at higher level of education. This method is economical, can be used for a large number of students, material can be covered in an organized manner and the teacher has a better control of time and material.

Discussion method (Tadvidhya Sambhasha): - It is a free verbal exchange of ideas between group members or teacher and students. For efficient discussion the students should have prior knowledge and information about the topic to be discussed. The Guru is also observed to be sitting with other learned sages and men of learning. And in many discussions the pupils as well as the sages present, participate and keep their opinions until in the end, the master analysis the whole range of the subject in its various aspects and gives his final conclusion on the subject under discussion.

Teaching method as mentioned in sushruta Samhita

Pramana- Pramana Sharir is defined as the knowledge related to the body in relation to life-span, measurement of parts and sub-parts of the body. The body has been related (regarding measurement) with own fingers. The whole body is 120 Angula in vertical length and if vertical height of the body is same to the horizontal length in position when arms are abducted up to 90 degrees, then it is in Sama Pramana. Sushruta told about the characters of Dirghayu Purusha related to Sharir Pramana. Like, the persons having Sama Pramana (standard measurement) of the body are blessed with longevity, immunity, strength, happiness, supremacy, wealth and other qualities. Those having body with lesser or higher measurement have qualities opposite to these. All this explanation of Pramana shows that the concept of Pramana was primarily developed in the era of Ayurveda. In Ayurveda, the concept of Pramana is used widely in various branches like Dravya Guna, Panchakarma, Bhaishajya Kalpana, Sharir Rachana etc. in different ways. Anthropometry is a new branch of modern science which is developed by the concept of Pramana. The difference is that in Ayurveda the measurements were taken with help of Swa-Angula. Acharya Sushruta have clearly mentioned the Pramana of all surgical instruments (e.g. Swastika Yantra is of 18 Angula, Sandansh Yantra is of 16 Angula, Nakhashastra and Eshani is of 8 Angula and the instruments used in Arsha Chikitsa etc.). All the instruments mentioned in Samhita are scientifically designed according to the anatomical measurement (Pramana) of structures of related organ or part where they will be used. Acharya has mentioned about the measurements of different Anga - Pratyanga of human body. Pramana Sharir is the first unit of measurement. It was customized as it differs from person to person. There were no instruments developed at that time to take measurement but the modern science has developed so many instruments like vernier calliper, anthropometer rod and craniophore. Anthropometric data can be used to assess unknown body measurements from known measurements. This is highly important in developing concepts related to forensic medicine in Ayurveda, a perfect example about assessment of total height from different known measurements based on references of Pramana Sharir. Therefore, we can see that concepts of anthropometry are mentioned in Samhita at places with important discussion which shows concept of anthropometry in Ayurveda and shows the way for more explanation for better use.

Shadanga Sharir (Concept of regional anatomy)- Acharya Sushruta has divided the whole body into six regions- four extremities, trunk the fifth and head as the sixth one. The study of

anatomy can be done by many ways. Main purpose to study anatomy is teaching. Therefore, anatomy can be sub divided into two types-macroscopic or gross anatomy and microscopic anatomy. Regional anatomy is one of the important branches of macroscopic anatomy. Shadanga Sharir according to Ayurveda- Body is divided in 6 parts- The word "Shakha" is used for extremities of body by Acharya Sushruta that means it is the region of body extending from Kati-Sandhi to Padanguli. Extremities are used to perform physical activities and take part in locomotion. The word "Madhya" is used for middle part of body by Acharya Sushruta that means it is area of body from Kantha to Guda according to Sushruta Samhita commentary. It includes chest and abdomen. The middle part of body plays an important and essential role in performing vital functions such as respiration, digestion, metabolism and excretion. The head is the controller of all our activities and thinking. As per modern science. Mainly body divided into head, neck and trunk; trunk further sub divided into thorax, abdomen, back and pelvis and paired upper limbs and lower limbs. Regional anatomy is the method of studying body composition by focusing on a specific part, region or area. The arrangement and relationship of different systemic structures like muscles, arteries, nerve etc. are useful in study in an order. Regional anatomy also observes the body's arrangement by layers like skin, subcutaneous tissue and deep fascia; than deep fascia covering the deeper structures like muscles, skeleton and cavities which contain viscera. In this way we can say that the concept of regional anatomy was known that time also.

Upama- As mouth of the Rohita fish is shaped, uterus also has the same feature and shape. Yoni (genital tract), resembling in shape with the interior of conch shell, has three folds, uterus is positioned in the third fold.

Heart resembles Pundarika (lotus-bud) and is pointed downwards. If we see heart along with arch of aorta and thoracic aorta, it looks similar to the description mentioned in Ayurveda about Hridaya. Heart is a Sadhya Pranahara Marma also, so any injury or trauma occurs to it, definitely leads to death.

Shava vicchedana (dissection)- Anatomy and dissection has been studied as a milestone of medical education; in ancient Egypt, dissection was a divine custom recommended as a rite of passage to the kingdom of the dead, even if the method was more likely a crude autopsy than an anatomical dissection we planned today. Towards the end of 20th century, dissection was the prime support in medical education field. Gross Anatomy is a very large subject in the fields of science. Today defining the accurate anatomical site of a lesion is critical for a physician than to solve a problem. And also for surgeons or for anyone who performs an invasive procedure on a patient. Dissection of cadavers is the best tool to teach and learn about the Human Anatomy. Dissection method gives more clearance about the organs to the students and this helps them while doing surgical procedures and they are able to recall the points very easily and the related nerve and blood supply can be remembered only by the dissection method. "It allows the evolution of a 3- dimensional mind map of the various anatomical parts of the body". By the reveal of many other procedure of Anatomy teaching and the following reduction of hours spent by students dissecting, several experts have given mixed opinions about whether it's helpful or not. Dissection method has its own limits, like this is not useful for teaching various important areas such as skeletal, muscular anatomy or nervous system anatomy in the contracted state. For these lectures, substitute methods would be needed, like cleaned and articulated skeletal models, plastinated models, radiological films, computer simulations, and thiel-method embalmed bodies.

Oral Training method - Oral training is one aspect which elementally differs from the modern system of education. The Ancient Acharya were depended much on their power of memory while the moderns are reliable upon their books. The Ancients paid greater attention on raising the power of memory

Modern Teaching Method

❖ Power point presentation- With technological development, use of power point presentation has been increased excessively for classroom teachings in medical education. Use of progressive multimedia technologies and user-friendly version of MS power point presentation has been increased excessively for classroom teachings in the present time. Most of the students liked the use of PowerPoint presentations (ppt). Teachers are increasingly using these educational technologies and power point has become a presentation main in medical colleges. Overall research shows that students like power point-type presentations to traditional lectures. Supporters claim that power point enhances learning, increases audience

interest and aids explanations of complex examples. Critics are complaint that power point discourage presenter– audience communication and limits the quantity of detail that can be presented. So, there is a lot of debate over advantages and disadvantages of power point.

❖ Medical Conferences, RoTP and CME's method- The thought of holding national and international conferences of scholars and scientists in any branch of knowledge is not restricted only to modern times. This was a trend flourished since ancient times too and we have many evidences in the Charak Samhita to think that either periodically or whenever there arouses a doubt or differences of opinion on important aspects or questions affecting the theory and practice of science, there happens to be a large or small conferences and discussions to resolve the doubts and establish or build an authoritative doctrine on the subject. These were different in their character from clinical meetings and debates. These were national meetings where scholars and thinkers from various parts of the country and even scholars from neighboring countries gathered for the advancement of the science. The Dept. of AYUSH is conducting many RoTP's and CME's for AYUSH teachers and practitioners, to spread good teaching practices and teaching methodology to teachers for adequate training of students and for enhancing their professional competence & skills.

❖ Ultrasound imaging method (USS)- Nowadays, USS has become the current non-invasive procedure of morphological study to aid or supplement the teaching of gross human anatomy in some medical school curricula. USS anatomy is based on its capability to reflect an image of the structures. Like any other skill, it needs both practice and content-specific knowledge. As the ultrasound waves penetrate body tissues of various acoustic impedances along the path of transmission, some are reflected back to the transducer (echo signals) while others penetrate deeper. Thus, an ultrasound transducer works both as a speaker (generating sound waves) and a microphone (receiving sound waves).

OTHER MODERN CONVENIENT METHOD

Simulation is one of the educational methods implementing in the basic course of the anatomy (Torres et al., 12 2014). It is a technique, which substitutes or strengthens doctor and patient experiences in controlled settings and therefore evokes or repeats considerable aspects of the real world in a fully collaborative manner. Through simulated patients and peer examination, anatomy can be studied in the living body and this technique is very useful in studying bones, joints, muscles, peripheral nervous system and abdominal organs (Chang et al., 7 2019; McLachlan, 10 2004).

Radiology- Diagnostic images and the understanding of these images require a solid thoughtful of anatomy and its normal variants. These images has been aided in narrowing the gap between the basic anatomy and the clinically applicable anatomy which many believe has been deficient (Jack et al., 36 2012). Radiology teaching such as ultrasonography, computed tomography (CT), magnetic resonance imaging (MRI) and x-ray offers in vivo visualization of the anatomy, as an addition to traditional ways and gaining approval to further strengthen the learning of anatomy in the practical situation (Chaudhury et al., 37 2019).

Prosection- In the absence of cadaver dissection, prosected specimens (the use of pre-dissected cadaver specimens) have been widely used in the teaching anatomy to medical undergraduate students (Collins, 20 2008). Interestingly, anatomical knowledge proceeding to prosection influenced the short term retention of the knowledge (Lackey-Cornelison et al., 21 2020).

Plastination

Plastination technique has been developed and is one of the best methods for preservation of organic tissue. It is widely used in anatomy to develop robust anatomical specimens of the whole body or body parts. In 1977, Dr. von Hagens in the Department of Anatomy at the University of Heidelberg planned plastination method for conserving anatomical specimens with reactive polymers (von Hagens, 22 1979). In plastination technique, water and lipids in the biological tissues are replaced by polymers such as silicone, epoxy and polyester. After the hardening of these materials, odourless, dry, long-lasting and easily transported specimens were obtained (Sora et al., 23 2019). In sheet plastination, semi-transparent slices of tissue are obtained and students become easy to study the structural and topographical anatomy in detail (Sora et al., 24 2012). Plastination procedure offers fully preserved specimen without any foul smell or toxic fumes (Hayat et al., 25 2018). Specimens can be preserved and storage easily for longer times more than that of conventional method (Haque, 26 2017). Plastination is not a replacement for traditional guided cadaveric dissection, but it does offer an additional learning implement to know and understand complex human anatomy (Riederer et al., 27 2014). Importantly, some students from recent studies have proved that the use of plastinated specimens is useful when learning anatomy (Latorre et al., 28 2016). Learning anatomy only in plastinated specimens is a compromise because of its restrictions in terms of tactile and emotional experience and skills that is delivered by wet cadavers (Fruhstorfer et al., 29 2011).

3D Printing

The three-dimensional (3D) printing is a modern enjoyable, effective method in which a 3D computer model is converted into a physical object (Silver, 38 2019; Garas, et al., 39 2018). 3DP digital models can be made of several materials such as nylon, polyvinyl alcohol, polyacetic acid, acrylonitrile butadiene styrene, wood, metal, and carbon fiber filaments (Iwanaga et al., 6 2021).

Some of students found 3D printed models are more flexible and durable in comparable to conventional plastic models (Mogali et al., 40 2018). But, if students only have access to 3 D printed models, it could lead to a deficiency of understanding the real size and the relation to other anatomical components (Huang et al., 41 2018). Furthermore, the research on 3D printing of the foregut, archived fetal materials and organs, using a donated body or 3D files on the internet, are of ethical implication (DG, 42 2019).

Virtual Reality (VR)

In virtual reality (VR), the user is fully immersed and feels present in a virtual setting. In augmented reality (AR), virtual objects such as anatomical models are superimposed into the user view of the real world. Models can be exhibited on an individual basis through devices including desktops, mobiles, head mounted devices and to broader audiences with stereoscopic projectors and screen-based AR systems. Students who used mobile AR had significantly higher test scores than those used text, two-dimensional pictures and graphs, are reported (Küçük et al., 43 2016). These technologies are still innovative and research on the usefulness is rare (Heather et al., 44 2019).

Virtual Dissection

Virtual dissection or digital dissection provides students with the innovative learning opportunities in anatomy. Now, virtual dissection is achieved on anatomy visualization table. Patient CT scans are loaded on a near life-size computer screen and through the powerful software interactions, students can operate the data to accomplish their dissection. Importantly, virtually dissection of the CT scans, through touchscreen, students can work in groups to understand the complex anatomic relationships and one of the best techniques to prepare medical students for clinical practice (Darras et al., 13 2018; Darras et al., 45 2019). Unfortunately, students interacting with only touchscreen, they are not able to appreciate the way bone, tendons, muscle feel and loss of haptic feedback accompanies cadaveric dissection (Darras et al., 13 2018).

Social media

Social media gained popularity in the anatomy field and becoming increasingly recognized as educational help to the anatomy educators (Pollock, Rea, 46 2019). Facebook pages created by anatomists and most of the student users observing that interacting with the anatomy education pages helped their learning (Pickering, Bickerdike, 47 2017). The best way to teach and learn anatomy is through cadaveric dissection, but because the limited resources and access to such facilities so the social media could fill the gap (Iwanaga et al., 6 2020; Rai et al., 48 2019). Human cadavers or cadaveric material images or videos are being shared on public and this has a major ethical implication since there is no clarification of cadaveric source or consent received from the donors to share (Hennessy et al., 49 2020).

Influence of Covid-19 Pandemic on Anatomy Education

Coronavirus disease 2019, Covid-19, pandemic has been driven the fastest alterations to higher education across the world, required by social distancing measures avoiding face-to-face teaching. This has led to an almost direct switch to distance learning by most of the higher education organisations (Longhurst et al., 4 2020). A number of universities including the medical schools through the world passed from these Covid-19 pandemic experiences and had to familiarize to a new distant environment in order to remain providing the medical education to their students(Longhurst et al., 4 2020; Pather et al., 50 2020).

Dr Saverino suggested that the study of anatomy with cadaver dissection has become almost non-existent in most of the medical schools due to the deficiency of the number of corpses as compared with the increasing number of students. Furthermore, this dissecting cadaver practice would be impossible in this pandemic time due to COVID-19 (Saverino, 51 2020). Other authors proposed that teaching anatomy with dissection in the time of COVID-19 pandemic is important and possible. Three main things are mandatory for this to occur safely such as non-infectious cadavers, mechanisms to meet the demands of social distance, and the institutional commitment to remain training physicians using the best possible approaches (Ross et al., 52 2020).

In India, some authors present some of their experiences on pandemic time teaching due to COVID-19. Initially, few faculties started with sending power points and YouTube links to students to make successful process, but some of students have been a lot of confusion regarding the new teaching technique. Few institutions started with online teaching using

platforms such as Zoom, Google Meet and Webex. Authors continue experience in their institution (All India Institute of Medical Sciences, Bathinda) by taking students' opinion regarding online teaching method. They found some of students from either rural or suburban areas facing network issues and were not in favour of online platforms. The anatomy department started used video lectures with recorded narration and students found this useful. By time, most of students found agreement with online discussions using Google classroom, followed by an online assessment such as quiz competition (Patra et al., 53 2020).

CONCLUSION

Students must receive an appropriate and adequate training in the anatomy education. A shift to virtual anatomy education is significant to support the learning of students in COVID-19 crisis (Singal et al., 54 2020). The anatomists are encouraged to explore and revisit all possible teaching approaches to improve and develop renovations in the anatomy education. Recognizing difficulties facing teachers and students in COVID-19 pandemic to develop new strategies to help them is an essential. Further studies should be recommended from different medical schools all over the world to collect and analyse the feedback of students and teachers which will be helpful for an appropriate and timely adjustments in the online anatomy education and assessments.

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