Review Article

www.ijrap.net

PRAMANA SHARIRA: EXPLORING NEWER HEIGHTS IN VYAVAHARA AYURVEDA

Rakesh Narayanan V ^{1*}, Ashwathykutty V. ²

¹Ph.D. Scholar, Department of Sharir Rachana, National Institute of Ayurveda, Madhav Vilas Palace, Amer Road, Jaipur, Rajasthan, India

²PG Scholar, Department of Rog evam vikriti vijnan, National Institute of Ayurveda, Madhav Vilas Palace, Amer Road, Jaipur, Rajasthan, India

Received on: 07/09/15 Revised on: 23/09/15 Accepted on: 12/10/15

*Corresponding author

E-mail: vatakkath.rnv@gmail.com

DOI: 10.7897/2277-4343.07124

ABSTRACT

Anthropometry is the branch of anthropology which specifically deals with the measurements related to the human body. It finds its application in various fields like physiognomy, phylogeography, phrenology etc. But it is extremely significant when it comes to forensic science. In Ayurveda, this particular field remains untouched because of the unexplored application of Pramana Sharira, the Ayurvedic counterpart of Anthropometry in Vyavahara Ayurveda. This study throws some light to the applied aspects of Pramana Sharira in Vyavahara Ayurveda.

Keywords: Anthropometry, Pramana Sharira, Vyavahara Ayurveda, forensic science.

INTRODUCTION

Anthropometry is the measurement of human beings on living, dead or on skeletal material. It constitutes various measuring techniques that quantitatively present the dimensions of the human body and skeleton. Anthropometry is a basic tool of biological anthropology, but it has a long tradition of use in forensic sciences and it is found that its applications are increasing in the recent past. It employs various somatometric and osteometric techniques for the estimation of stature, age, sex and race the big fours of forensic anthropology.

Unlike in Modern System of medicine, this particular field is fairly neglected in Vyavahara Ayurveda, which is the Ayurvedic counterpart of forensic medicine. Lot many reasons can be cited for the poor development of this particular discipline. But a significant explanation would be the largely ignored application of knowledge of Praman Sharira in this regard. Varied applications of Praman Sharira are rarely explored while the learning or teaching is undertaken. As a sound knowledge of Anatomy, especially anthropometry contributed greatly towards the advancements in forensic medicine, revival of Vyavahara Ayurveda will definitely follow the development of Praman Sharira as a discipline of Sharir Racana.

In this study an attempt is made to analyze the various references of Praman Sharira in our classics and to bring out the possibilities of its varied applications in forensic science.

Anthropometry in forensic medicine

The usage of anthropometry in forensic science started from 1882 when Alphonse Bertillon, a French police expert introduced a criminal identification system based on anthropometric measurements. This was based on mainly three fundamental concepts- the fixed condition of the bone system from the age of twenty till death; the extreme diversity of dimensions present in the skeleton of one individual compared to those in another; the ease and relative precision with which certain dimensions of the bone structure of a living person can be measured using simply constructed calipers¹. This system of

identification gained rapid acceptance, but because of its few drawbacks another effective systems evolved, e.g., dactylography

The term 'forensic anthropometry' can be introduced for the branch of applied anthropology, which make use of techniques of anthropometry in forensic context. In other words, "forensic anthropometry is a scientific specialization emerged from the discipline of forensic anthropology dealing with identification of human remains with the help of metric techniques"²

Anthropometry can be divided into two branches; somatometry and osteometry.

Somatometry

It comprises the measurement of both the living body and cadaver with its head and face. Somatometry is an important technique in the study of human biological variability including the variation in morphology.² Somatometry finds a very useful role in the study of age estimation from different body segments in a fixed set of individuals.

Osteometry

It includes the measurement of the skeleton i.e. the measurements of the bones along with skull. With this technique, a forensic scientist can understand the variation in bony skeleton of different populations of the world. The technique has been successfully used in the estimation of stature, age, sex and race in forensic sciences.²

Estimation of 'Big fours' in anthropology

The four parameters like age, sex, race and stature are taken as the "Big Four" of forensic anthropology². Skeletal examination helps in the reliable determination of age, sex, race and stature of the individual.³

Estimation of stature

Stature estimation is an indispensable part of the identification process of human skeletal remains or body parts⁴. Apart from that, it is also used widely in clinical medicine. Stature is the

maximum distance measured from the point where the heel touches the floor to the highest point of the head while the person is in erect position⁵. It is an easily measured and widely used anthropometric parameter in clinical medicine such as calculation of BMI², BMR, and Creatinine Height index and for interpretation of lung function tests. It is also used as an indicator of nutritional status⁶.

The major determinants of height of an individual are the length of the long bones and the height of the vertebral column. The maximum stature is achieved at the time of fusion of long bones and at the end of complete growth of the vertebral column. This skeletal growth ends at the age of 18 to 20 years. After achieving maximum stature, the bones are in relatively static period up to 40 years of age after which the natural process of senile degeneration takes place⁷. The measurement of stature is either not possible or not accurate in situations where patients cannot assume the posture necessary for the accurate measurement. This difficulty may be encountered in critically ill patients who are monitored in ICU where many indexes are calculated using height, Arm span and knee height are two such anthropometric variables proven by many studies and used commonly at present⁸. Arm span is the maximum distance between tips of the longest fingers of both hands while the person extends both arms at the level of the shoulders⁹. Knee height is defined as the length measured parallel to the long axis of the tibia from the heel of the foot to anterior surface of the thigh while ankle and knee are bent at a 90-degree angle⁹. It has an additional advantage as it could be measured while patient is seated or even lying down¹⁰.

The stature of an individual can be estimated from long bones, especially the tibia and the femur as these have a direct correlation to the height of an individual. The lower limb length is the greatest contributor to the standing height, hence the most predictive equation is based on length of lower limb, the femur, Tibia and fibula¹¹. The tibia is ideal in this application as it resists erosion and keeps its anatomical shape for long even after burial¹². Bone and stature of an individual are influenced by numerous factors as age, gender, race, geographical climate, nutrition and genetic factors¹³. Hence, the correlation factors of one region will not hold good for the other, as this necessitates the researches to be done on a regional basis¹⁴.

There are various ways to estimate stature from bones, but the easiest and reliable method is by regression analysis¹⁵. Regression formulae derived from the major long bones are generally considered to be more accurate.

However, the formulae derived cannot be generalized to all population groups, hence it is necessary to derive regression equations which are region wise and population specific¹⁶ which can be applied to estimate stature of a population from its skeletal remains.

Determination of sex

Sex is comparatively easy to determine from the skeletal material and one of the most reliable method if necessary parts of the skeleton are available in good conditions. The most often used bones are the pelvis and the skull but the round heads of the ball joints can also provide very reliable information regarding determination of sex¹⁷. Sex determination is considered to be reliable when the remains are from long bones and up to 95% accuracy is achieved.

Determination of Race

Determination of race is not that simple as sex. In spite of several multivariate statistical studies of specific measurements of the skull and a few long bones, it remains as one of the most

problematic areas skeletal identification¹⁸. Race determination is further complicated by another major issue i.e. intrinsic variability within each major genetic breeding population or endogamous group makes the assessment difficult.

Praman Sharira in Ayurveda

The Sharira pramana or measurements pertaining to body have been elaborately described in all major samhitas giving us an insight into the level of knowledge and understanding of human body that existed during the period of samhitas

We get elaborate descriptions in our brihatrayis with their commentaries throwing light in to the significant areas. Acharya Sushruta has described praman sharira in context of aturapariksha or examination of the patient in the 35th chapter of Sutra Sthana, i.e. aathuropakramaneeyamadhyaya chapter. Acharya Charaka has given his description of praman sharira in the 8th chapter of Vimana Sthana, i.e. Rogabhishakjitiya chapter. Vagbhata describes it in Ashtanga sangraha named Prakriti bhediyam adhyayam.

The different measurements given by Acharya Charaka and Sushruta can be tabulated as follows.

Angula- the tool of measurement

One of the important contributions of our Acharya in this aspect is how they devised a standard measuring unit for the measurement of human body in an era when neither standardized measures nor measuring units were available which not only provided a unit of measurement but also provided the flexibility of being personalized.

In fact, Acharya doesn't give the data in form of absolute measurements of various parts, but as proportions to a fixed body part, namely the breadth of the finger of the individual being measured. This unit of measure is called anguli praman. The word anguli means finger and praman means measurement. Thus anguli praman or finger measurement is the equal to the average breadth of the finger of the individual whose body is being measured.

Gayadasa, commentator of Sushruta Samhita says that one angula is three yava pramana¹⁹. But there are many different opinions regarding the angula pramana. The most logical conclusion that evolve is that average breadth of the digits of upper limb excluding the thumb.

A fine analysis of the above data can derive significant inter measure comparisons which can be used to evaluate unknown body measurements from known measurements. This is highly significant in developing concepts related to forensic medicine in Ayurveda.

For example, if the cut upper limb or any other body part is obtained, the data of praman sharira and these proportions of the human body can be used to determine the height and all other body measurements of the individual. It becomes further significant when observed that even if a cut digit of the individual is obtained, a scientific estimation of all his body measurements can be indirectly made based on data obtained from the analysis of references related to praman sharira.

Thus the estimation of total height from various known measurements can be derived as follows. These measurements are given as per reference in Charaka Samhita because Acharya Sushruta describes the total vertical span rather than the height of the individual.

Table 1: Measurements Described by Sushruta and Charaka arranged in ascending order (less than 4 Angula)

Name of measure-Sushruta	Measure in angula	Name of measure-Charaka	Measure in angula
Naasaputa Maryada	2/3		
Paadakanishthika	0.8		
Paadaanamika	1.2		
Paadamadhyama	1.6		
Paadangushtha	2		
Paadapradesini	2		
Vrushana vistara	2		
Chibuka	2		
Dashana	2		
Naasaputabhaaga	2		
Karnamula	2		
Bhurantrara	2		
Nayanantara	2		
		Stana paryanta	2
		Hrudayam	2
Kanishthika	3 ½		
Angushta	3 ½		

Table 2: Measurements Described by Sushruta and Charaka arranged in ascending order (Four and Four and Half Angula)

Name of measure-Sushruta	Measure in angula	Name of measure-Charaka	Measure in angula
Prapada aayama	4		
Paadatala aayama	4		
Paarshni vistara	4		
		Paada utsedha	4
		Jaanu aayama	4
		Chibuka	4
		Ostha	4
		Akshimadhya	4
Mehana	4		
Vadanantara	4		
Nasa	4	Nasa	4
Karna	4	Karna	4
Lalata	4	Lalata	4
Greevochraya	4		
Drishtyantaraayama	4		
Hastaatala vistaara	4		
Mukha	4		
		Sirodhara utsedha	4
Pradeshini	4 ½		
Anaamika	4 ½		

Table 3: Measurements Described by Sushruta and Charaka arranged in ascending order (5-11 Angula)

Name of measure-Sushruta	Measure in angula	Name of measure-Charaka	Measure in angula
Prapada vistara	5		
Paadatala vistaara	5		
Paarshni aayama	5		
		Aasya aayama	5
		Mehana parinaaha	5
Angushta mula-Pradesini	5		
Sravana-Apanga antara	5		
Madhyamanguli	5		
		Paada vistaara	6
		Vrushana aayama	6
		Mehana aayama	6
		Amsa	6
Hastatala aayama	6		
		Vrushana parinaaha	8
		Skandha	8
		Kaksha	8
		Bastisiras aayama	10
		Udara vistaara	10
		Parswa vistaara	10
Mastaka-Avatukeshanta	10		
Keshanta-Mastaka antara	11		

Table 4: Measurements Described by Sushruta and Charaka arranged in ascending order (12 -16 Angula)

Name of measure-Sushruta	Measure in angula	Name of measure-charaka	Measure in angula
Bhagavistaara	12	Bhagaparinaaha	12
Mehana-Nabhi	12		
Nabhi-Hriraya	12		
Hrdaya-greeva	12		
Stanantara	12	Stanantara	12
Mukhaayama	12	Aanana utsedha	12
Manibandha sthoulya	12		
Prakoshtha sthoulya	12		
		Udara aayama	12
		Parswa aayama	12
		Ura utsedha	12
		Hasta	12
		Trika Utsedha	12
Paada aayama	14	Paada aayama	14
Paadamadhya parinaaha	14		
Gulphamadhya parinaaha	14		
Jangha Madhya parinaaha	14		
Jaanumadhya parinaaha	14		
Karna-Avatuantara	14		
		Prapaani	15
Indrabasti parinaaha	16		
		Jangha parikshepa	16
Amsapeetha Kurparantaraayama	16		
		Jaanu parikshepa	16
		Kati vistaara	16
Manibandha-Kurparantara	16		

Table 5: Measurements Described by Sushruta and Charaka arranged in ascending order (18 -120 Angula)

Name of measure-Sushruta	Measure in Angula	Name of measure-Charaka	Measure in angula
Jangha aayama	18	Jangha aayaama	18
Uru aayama	18	Uru aayama	18
Urovistaara	18		
		Prushtha Utsedha	18
Greeva parinaha	20		
		Sirodhara parinaaha	22
		Aanana parinaaha	24
		Uro vistara	24
Hasta aayaama	24		
		Uru parikshepa	30
Janu upari sakthi aayama	32		
Uru parinaaha	32		
Bhuja parimaana	32		
		Sira parinaaha	32
		Purushaayama	84
Purushaayaama	120		

The total height of the individual would be

1. 84 times the average width of the fingers of the upper limb
2. 21 times the lengths of nose, vertical length of ear, height of forehead, distance between pupils, height of foot and knee joint and vertical height of neck
3. 14 times the width of the foot, length of penis and length of shoulder region
4. 7 times the vertical height of the face, distance between nipples, lengths of abdomen, flanks, vertical height of chest, length of the hand and height of sacral region
5. 6 times the length of the foot
6. 5.25 times the length of arm, vertical height of head and circumference of leg and knee
7. 4.67 times the lengths of leg and thigh
8. 3.5 times horizontal span of chest
9. 2.8 times circumference of thigh and
10. 2.6 times the head circumference.

In this study, only the total height is compared to the other body measurements. In the same fashion, any measurement of the body can be derived even from a single known measurement by

the method of inter measure comparison. This is highly valuable when the body measurements are to be estimated in a mutilated or dismembered body.

CONCLUSION

The above discussion shows the deep understanding of our Acharya in the field of anthropometry two thousand years back when no such sophisticated tools or measuring techniques were available as used in modern era. A deeper analysis of these measurements helped us to derive significant inter measure comparisons. Various known measurements could be proportionately related to the total height of an individual which can be compared to the estimation of stature in forensic medicine. In forensic medicine usually long bones were used (i.e. tibia, femur and ulna/ arm span or knee height) for the estimation of stature in early days. But in later studies, scientists have used each and every bone of the human skeleton right from femur to metacarpals in estimation of stature. They all have reached a common conclusion that stature can be estimated with

great accuracy even from the smallest bone, although, they have encountered a small error of estimate in their studies. The above explanation describes the method of estimation of total height from the measurements of relatively smaller parts like nose, ear, penis etc.

Forensic medicine usually relied upon the formulation of regression equations for the estimation of stature. But a major hurdle that faced by the modern anthropologists is that the formulae derived cannot be generalized to all population groups, hence it is necessary to derive regression equations which are region wise and population specific which can be applied to estimate stature of a population from its skeletal remains. This issue is very well countered in Ayurveda as it uses a personalized and universal tool of measurement, Angula. It could be used as a tool of measurement in any population or in any part of the world as it is an individualized technique. The description of the various body parts in proportions to a fixed body part also held the advantage that the problem of individual variations and making the data universal were solved, thus creating a system of measure which can be used effectively anywhere and used to differentiate the normal from the abnormal quantitatively. Thus, our Acharya overcame the difficulty of having to describe absolute measures and described a means for examining persons of all body sizes. Though individual variations exist everywhere in anatomy, it gave a general idea of the human form. To conclude it can be said that anthropometric data can be used to evaluate unknown measurements form known measurements. It is highly interesting to observe that even with a cut finger available, the whole body measurements can be scientifically estimated using the inter measure comparisons which is highly significant when mutilated or dismembered bodies are available. The study shows the immense potential of Praman Sharira in developing the branch of Vyavahara Ayurveda that can be explored further. It illuminates the fact that the deep and true understanding of our samhitas can take our science to newer heights of knowledge.

REFERENCES

1. Moenssens AA. Fingerprinting Techniques- Inbau Law Enforcement Series, Radnor, Pennsylvania: Chilton Book Company, 1995
2. Krishan. Anthropometry in Forensic Medicine and Forensic Science-'Forensic Anthropometry'. The Internet Journal of Forensic Science. 2006 Volume 2 Number 1. accessed on August 30, 2015
3. Buchner A. The identification of human remains. Int Dent J. 1985 Dec; 35(4):307-11.
4. Trotter M, Gleser GC. Estimation of stature from long bones of American whites and Negroes. Am J Phys Anthropol 1952; 10:463-514
5. Lohman TG, Roche AF, Mattorell R 1988, 'Segment Length', Anthropometric Standardization Reference Manual, Human Kinetics Publishers Inc, Illinois, pp18-20.
6. Food and Nutrition Research Institute –Philippines 1998, 'Arm Span and Knee height as Proxy Indicators for Height', 5th National Nutritional Survey, DOST, Mannilla.
7. Reddy KSN 2006, 'Identification', The Essentials of Forensic Medicine, 25th edition, Suguna Devi, Hyderabad, 50-86.
8. R Varun TMK Jayasinghearachchi, R Priyalini, MDP Gunasena. Arm span and knee height as predictors of stature among Peradeniya medical students. Sri Lankan Journal of Anaesthesiology 2011;19 (2):76-80.
9. Lohman TG, Roche AF, Mattorell R 1988, 'Segment Length', Anthropometric Standardization Reference Manual, Human Kinetics Publishers Inc, Illinois, pp18-20
10. Chumlea WC, Roche AF, Stienbaugh MI. Estimating stature from knee height for persons 60-90 years of age', Journal of American Geriatric Society, 1985;33:116-120.
11. Trotter M, Gleser GC. A re-evaluation of estimation of stature based on measurements of stature taken during life and of long bones after death. Am. J Phys. Anthropology.1958; 16:79-123.
12. Krici Y, Ozan H. Determination of gender from the tibia of adult Turkish cadavers. Kaibogaku Zasshi. 1999; 45:537-543.
13. Bhavna S, Surinder Nath. Use of Lower Limb Measurements in Reconstructing Stature among Shia Muslims. The internet Journal of Biological Anthropology. 2009; 2(2).
14. Akhilesh Trivedi, Sudhir Saxena, Rajesh Morya, Massarat Jehan, Dr. Vipendra Bhadkaria1. Stature Estimation Using Per-Cutaneous Tibial Length in People of Gwalior Region. IOSR Journal of Dental and Medical Sciences. 2014;13(5):65-70
15. Kumar P, Shah Nawaz K, Varma G. Study of Estimation of Stature by the Length of Femur. Journal of Evolution of Medical and Dental Sciences 2014; 3(12): 3166-72.
16. Chavan SK, Chavan KD, Mumbre SS, Makhani CS. Stature and Percutaneous Tibial Length: A Correlational Study in Maharashtrian Population. Indian Journal of Forensic Medicine and Pathology. 2009; 2(3):109-12
17. Iscan MY, Miller-Shaivitz P. Determination of sex from the tibia. Am J Phys Anthropol 1984; 64:53-57
18. Giles E, Elliot O. Race identification from cranial measurements. J Forensic Sci 1962; 7:147-157.
19. YT Acarya, editor. 3rd reprint ed. Commentary Nyaya Candrika of Gayadasa on Susruta Samhita of Susruta. Nidana Sthana; Arsa: Chapter 2, Verse 7. Varanasi: Chaukhambha orientalia; 2007 p.272.

Cite this article as:

Rakesh Narayanan V, Ashwathykutty V. Praman sharira: Exploring newer heights in Vyavahara Ayurveda. Int. J. Res. Ayurveda Pharm. Jan – Feb 2016;7(Suppl 1):31-35
<http://dx.doi.org/10.7897/2277-4343.07124>

Source of support: Nil, Conflict of interest: None Declared

Disclaimer: IJRAP is solely owned by Moksha Publishing House - A non-profit publishing house, dedicated to publish quality research, while every effort has been taken to verify the accuracy of the content published in our Journal. IJRAP cannot accept any responsibility or liability for the site content and articles published. The views expressed in articles by our contributing authors are not necessarily those of IJRAP editor or editorial board members.