

## COMPREHENSIVE STUDY ON ASTHISANKHYA SHAREERA IN RELATION TO ANATOMY

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## ABSTRACT

*Acharya Sushruta* explained that the organs of the body destroy after death except *Asthi*. Importance of *Asthi* & *Sandhi* is explained that it supports the human body just as trees are supported by the middle core *Sara* present inside the trunk. Knowledge of *Asthi* can be traced back from the *Vedas* passing chronologically down to *Samhitas*. Bones are the hard-connective tissue forming the substance of the skeleton of most vertebrates, composed of a collagen rich organic matrix impregnated with calcium, phosphate, and other minerals. Bones protect the various organs of the body, produce red and white blood cells, store minerals, provide structure and support for the body and enable mobility. Importance of knowledge of *Shareera Sankhya* is given in our *Samhitas*. It explained that the clinician who has knowledge about human body with its all parts with their enumeration never gets distracted. There is different opinion regarding the number of *Asthi* in different *Samhitas*. According to *Acharya Charaka* and *Vagbhata* 360 bones are present in *Shareera*. 300 bones are present in the *Shareera* according to *Sushruta*. The adult human body has 206 bones as per modern anatomy. Here is an attempt to compare the *Acharyas*'s view of *Asthi Sankhya Shareera* with the modern human anatomy.

**Keywords:** *Asthi*, Bone, *Asthi Sankhya*

## INTRODUCTION

*Asthi* is one of the basic & most important structure of the body. According to *Ayurveda*, human body is made of *Dosa, Dhathu & Mala*<sup>1</sup>. Among the seven *Dhathus*, *Asthidhathu* is concerned with the *Dharana* of *Shareera*. It helps in the formation of proper body frame owing to its hard nature. The word *Asthi* is derived from the “*Asyathe ithi asthi*”<sup>2</sup>. It suggests that *Asthi* is a substance that is not generally decomposed as fast as other associated parts of the body like muscles, vessels etc<sup>3</sup>. It remains in the same state even after a long period of time after death. Hence the term *Asthi* has been designated for the bones. Bone is the substance that forms the skeleton of the body. It is chiefly composed of calcium phosphate & calcium carbonate<sup>4</sup>. Bone & cartilaginous framework of the body constitute the skeleton. In human anatomy, the term skeleton usually means endoskeleton. In some vertebrates the skeleton framework is found both externally and internally<sup>5</sup>. In human beings the exoskeleton is very rudimentary, being represented by nails & enamel of teeth only. Study of the structure & function of the skeleton & bony structure are called osteology<sup>6</sup>. According to *Ayurveda*, *Asti Shareera* is the study of human body in terms of anatomy of bones. Numbering of the parts which is present in the body is very much important to differentiate it from the abnormality. In *Charaka Samhitha Shareera Sthana* 7<sup>th</sup> chapter explained that a physician well versed in the enumeration of the parts of the body will not be confused during practice.<sup>7</sup> *Sushruta Samhita Shareera Sthana* 5<sup>th</sup> chapter *Shareera Sankhya Vyakarana* mainly deals with the numbering of the *Anghas & Prathyangas* of the body<sup>8</sup>. Here is an attempt to compare the *Acharyas*'s view of *Asthi Sankhya Shareera* with the modern human anatomy.

### Formation of *Asthi Dhathu*

*Charaka* in his *Chikitsa Sthana* explained that from *Medadhathu Asthi* get formed. From *Asthi Dhathu Majja* is formed<sup>9</sup>. *Chakrapani* commented on this concept as, due to the action of respective *Dhatwagni*, *Utharothara Dhatus* are formed<sup>10</sup>. *Sharangadhara* explained that *Medo Dhathu* get *Pakwa* by *Medo Dhatwagni & Vayu* will do the *Shoshana* of this substance & this forms the *Sara* of the *Shareera* i.e. *Asthi Dhathu*<sup>11</sup>.

The process by which bone forms is called ossification or osteogenesis<sup>12</sup>. Mesenchymal cells which differentiate into osteogenic cells form a structural basis which give rise to bone directly or through an intermediate stage of cartilage. Thus, ossification is classified as

- Ossification in membrane
- Ossification in cartilage

Ossification in membrane is an urgent affair & the process is completed with extreme rapidity whereas ossification in cartilage is a gradual & leisurely procedure<sup>13</sup>.

***Panchabhouthika constitution of Asthi:*** every substance is made of all 5 *Mahabhoothas*, but *Asthi* has predominance of *Prithvi & Vayu Mahabhootha*<sup>14</sup>.

***Asthi Karma;*** *Dehadharana, Majjapushti* & supporting the *Mamsa, Sira & Snayu* are the *Asthi Karma*. *Acharya Sushruta* mentioned the importance of *Asthi & Sandhi* is the support of the human body just as trees are supported by the middle core *Sara* present inside the trunk. Major structure like *Sira, Snayu* are held in their proper position as they are attached to the bones. Hence none of these structures are fall off<sup>15</sup>.

Bones provide protection to the underlying soft tissues and organs. Hence even all other accompanying structures that are attached to the bones shrivel and degenerate, bones remain unchanged owing to their firmness. Bone tissue makes up about 18% of the weight of the human body. The skeletal system performs several basic functions like support, protection, assistance in movement, mineral homeostasis, blood cell production and Triglyceride storage.

***Asthi Prakara;*** *Acharya Sushruta* explained 5 types of *Asthi* i.e. *Kapala, Ruchaka, Taruna, Valaya* and *Nalaka*<sup>16</sup>

*Kapala*-These are flat in nature. Literally it means bone which covers and protect brain. This type of *Asthi* present at *Janu, Ganda, Shira, Nitambha, Tala, Amsa, Shankha*

*Ruchaka-Dashanas* are considered as the *Ruchakasthi*.

*Taruna*- These are *Mridu Asthi* i.e. which does not get *Ghanata* is considered as *Taruna Asthi*. *Asthis* present at *Ghrana, Karna, Ghriva, Akshikoshha* are example for *Taruna Asthi*.

*Valyasthi*-bones which are curved in structure and which is present over *Parshwa*, *Prushta*, *Uras* are considered under *Valayasthi*.

*Nalakasthi*- These are the long bones which is present at *Hastanguli*, *Paadanguli*, *Paadataala*, *Kurcha*, *Bahu Asthi*, *Jangha Asthi*.

Almost all bones of the body can be classified into 5 main types based on shape i.e., long, short, flat, irregular & sesamoid bones.

#### ***Asthi Sankhya***

Experts of *Vedas* or the followers of *Veda* opines that there are 360 bones<sup>17 18</sup> nevertheless in *Shalya Tantra* it is 300 only. *Sushruta* rejects the *Vedic* concept of 360 bones<sup>19</sup>.

**Table 1:**

Bones	Charaka	Vagbhatta	Sushruta	Anatomy
<i>Danta</i>	32	32	32	-
<i>Dantaulukhala</i>	32	32	-	-
<i>Nakha</i>	20	20	-	-
<i>Panipada angulyasthi</i>	60	60	60	56
<i>Panipada shalaka</i>	20	20	16	10
<i>Panipada shalakadhishtani</i>	4	4	10	
<i>Parshni</i>	2	2	2	2
<i>Gulpha</i>	4	8	2	2
<i>Mani</i>	2	6	4	8
<i>Arathni</i>	4	4	4	4
<i>Jangha</i>	4	4	4	4
<i>Janu</i>	2	2	-	-
<i>Janu kapala</i>	2	2	-	2
<i>Urunalaka</i>	2	3	3	5
<i>Bahu nalaka</i>	2	2	2	2
<i>Amsa</i>	2	2	-	-
<i>Amsa phalaka</i>	2	2	2	2
<i>Akshaka</i>	2	2	-	2
<i>Jathru</i>	1	-	-	-
<i>Taluasthi</i>	2	2	1	4
<i>Sroni phalaka</i>	2	2	2	2
<i>Bhagasthi</i>	1	1	1	-
<i>Prushtagata asthi</i>	45	30	30	12+5
<i>Greeva asthi</i>	15	13	9	7
<i>Uroasthi</i>	14	8	8	1
<i>Parshuka</i>	24	24	24	24
<i>ParshukaSthalaka</i>	24	24	24	-
<i>Parshukaarbuda</i>	24	24	24	-
<i>Hanasthi</i>	1	2	2	3
<i>Hanumoola bandana</i>	2	-	-	-
<i>Nasikagandakooda lalatam</i>	1	-	-	-
<i>Shankha</i>	2	2	2	4
<i>Shirakapala</i>	4	6	6	6
<i>Karna asthi</i>	-	2	2	6
<i>Ganda koota</i>	-	2	2	2

<i>Nasasthi</i>	1	3	3	5
<i>Kanta nadi</i>	-	4	4	1
<i>Anutrika</i>	-	-	1	1
<i>Trika</i>	-	1	1	1
<i>Kurparasthi</i>	-	2	2	-
<i>Gulpha sthanasthi</i>	-	4	-	-

## DISCUSSION

There are different opinions regarding the number of bones among the *Acharyas*. It is mainly dependant on the visualization of different bony parts. *Sushruta* has given a count of 300 *Asthi*. His view on *Asthi Sankhya* looks more precise in comparison to *Charaka* and *Vagbhatta* in terms of counting the number of bones and classifying them. According to *Charaka* and *Vagbhatta Asthi Sankhya* is 360 in number. Both the above-mentioned authors counted nails and nail bed as bones. *Charakacharya* and *Vagbhattacharya* also included 32 *Danta* and 34 *Danta Ulukhala* under the heading of *Asthi*. It is not counted as the bones according to anatomy. It can make a huge difference in total count of *Asthi*. Facets, body, arches and transverse process together forms a vertebrae and total 33 vertebrae are present according to anatomy. *Acharyas* included all these parts of vertebrae as separate bone. Many cartilages are also included under the *Asthi* only. *Sushruta's* view of *Asthi Sankhya* seems to be closer to the explanation of modern anatomy. According to anatomy there are 206 bones are present in the adult human skeleton. During *Balyavastha Asthis* will be *Mrudu* form. It will not be formed completely. So that the single bone can be appear as two or three pieces. During adulthood these become one. This can be reason for the change in the *Asthi Sankhya*. While comparing this view with the embryological development we can find some similarities. For example: the newly formed vertebra is cartilaginous in structure. This cartilaginous model of vertebra is soon converted into bone by ossification. The vertebrae ossify by the three primary centres of ossification. At birth each vertebra consists of three bony parts i.e. two vertebral arches and a centrum connected by two cartilage. The vertebral arches fuse posteriorly by 3-5 years of age to form spinous

process. The vertebral arches articulate with the centrum at cartilaginous neurocentral joints which disappear by 3-6 years of age. These vertebral parts may be considered as the separate bone by the *Acharyas*. That can be the reason behind the increase in the number. In case of *Nasaasthi*, there are 3 bones in the *Nasa*. Two *Nasasthi* and one *Nasapatala*. There are 2 nasal bones are present in nose and another one is the septal cartilage. *Nasa Patala* can be considered as the septal cartilage. But it also includes under *Nasasthi*. *Acharyas* explanation depicts that *Parshukas* are 72 in number. In one *Parshuka* only three parts are considered. But as per the anatomical explanation there are only 12 pairs of ribs are present. *Uraphalaka* is made of 6 bones according to *Samhita* but sternum is considered as the single bone in anatomy. The cartilaginous model of the sternum consists of manubrium, body and xiphoid process. Body of sternum is made up of four segments called sternebrae. This cartilaginous model of sternum gets ossified to form the sternum. Six sternebre, manubrium and xiphoid process may be considered as different bones by *Acharyas*. *Hanu Asthi*, *Kasherukas* are another such examples which is available in *Samhitas*. Consideration of *Danta* and *Dantaulukhala*, cartilaginous structure also as bones played role in the changes in their number.

## CONCLUSION

*Ayurveda* has contributed immensely towards the science of anatomy. The vast knowledge of anatomy which *Sushruta* had and his contribution to various sections of anatomy is hilarious. Numbering and naming of different structures in the body is available in *Samhitas* shows that the knowledge of our *Acharyas* was fairly advanced in ancient period even though the facilities were not so much. Changes in methodology of

study and documentations in both the systems make some differences in the numbering of the structures.

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