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# SANDHI SHARIR – A CRITICAL AND CORRELATIVE STUDY WITH MODERN SCIENCE

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## ABSTRACT

Our life is evolved on the 'art of locomotion'. Life would not have been easy if we could not have moved around, we move on our joints, the junction of bones well supported by soft tissues like muscles, ligaments and tendons. The flexibility and wide range of movements specialized and programmed in different ways in different bony joints makes our life movements possible. Movements for the key for progression and success, and the joints of our body are the key of movements. Various vedic, Ayurvedic and non ayurvedic literatures have given synonyms of sandhi like as *Sammilana, sangama, samyoga* etc, so that means *sandhi* is junction or articulation of two or more structures. According to modern view joint is a point where two or more bones are articulates with each other. Joint is exhibit a variety of forms and functions. They are constructed to allow for the different degree and types of movements like as flexion, extension, adduction, abduction etc. like sushruta samhita, in modern era, the joint is divided into two types of sthira or immovable and chestavant sandhi or movable joints. After that again it was divided into eight types. I modern anatomy and sushruta samhita get uniformity in place, types and compojition of joints, but the difference between the number can only be seen. Where 210 sandhis are described in sushruta samhita, there is description of 360 joints in modern anatomy. Acharya sushruta has described the location of 210 joints but given exact name of joints. In this research paper, I co-ordinate the sandhis with the modalities of 210 and according to their exact location, the name was given only.

**KEYWORDS:** Sandhi, Sammilana, Samyoga.

## INTRODUCTION

Ayurveda is the oldest medical science which deals with physical and psychological health of the human being. In Ayurvedic literature *Atreya*, Dhanvantari and all other communities have made it important the knowledge of body to have undoubtedly for the sake of knowledge. According to Sabdakalpadhruma the word *sandhi* is derived from sam + dha + ki pratyay means samyoga or articulation.[1] According to the father of Medicine Acharya Charak "*Ashthi sanyoga sthanam*" means meeting place between two or more bones called sandhi.[2] According to Sushruta father of surgery the term *sandhi* sharir means the study of joints not only bony joints but any places where *pesi* (muscles), *snayu (*ligaments), *siras* (veins) etc are associated or meeting with each other.[3] The term *sandhi* means *samyoga* or junction or meeting place or association. According to Acharya Sushruta Sandhi only *Asthi sandhi* should be taken into account where as sandhi of *pesi* (muscle) *snayu* (ligaments), siras (veins) etc are innumerable and should be excluded while counting. Thus sandhi or joint are the junction between two or more bone or cartilages. It is device to permit movements. According to other opinions like as sharangadhara Samhita sandhis are also the meeting place of any two structures in the body[4]; such sandhis are held together by sleshmak Kapha. Sleshmadhara kala presents in all kind of joints, for supporting its function, just like the moves easily when its axle hole is lubricated with oil, similarly the joints moves freely, lubricate with sleshma kapha.[5] Acharya Sushruta first divided the sandhis into two types.

### Classification of sandhis based on range of movements[6]

The sandhis are broadly classified into two groups.

**Chestavanta or chesta yukta sandhis (Movable joints or Diarthroses)** these are the joints which permit free movements. These joints are more flexible and move in various directns with liberty. They found in *shakhas* (extrimities), *hanu* (jaw), and *kati*.

### Chestavanta sandhis are again two types

### Bahu-chestayukta Sandhis

These joints allow wide range of movements. These types of joins are found in extrimities (elbow, knee, shoulder etc) and hanu (temporo-mandibular joint).

**Alpa chestayukta sandhis**

These are also movable joints but permits only a small range of movements. Such joints are found in vertebral column.

**Sthira Sandhis or Achestayukta Sandhis (Immovable joints)**

These are joints which do not permit movements and are stable. All the other joints apart from those explained in *chestavanta sandhis* are considered as *sthira sandhis.*

**Classification of sandhi based on 'structure of joints**

Based on structure and shape of joints, sandhids are eight types.[7] They are described below.

**Kora sandhi**

These are in shape of hinges and are totally mobile in one direction while partially mobile in opposite direction. Example of such sandhis are seen in the joints of anguli sandhi (joints of fingers, inter-phalangeal joint), manibandha sandhi (wrista joint), gulpha sandhi (ankle joint), janu sandhi (knee joint) and kurpara sandhi (elbow joint). These sandhis are compared to hinge joints.

**Ulukhala or udukhala sandhi**

These are the joint which allow pestle and mortar type of movements. Here the head shaped end of one bone articulates with the socket or pit like surface provided in another bone so as to form a ball and socket type of joint. Examples of ulukhala sandhis are kaksha sandhi (shoulder joint), vakshan sandhi (hip joint), dashana sandhi (articulation of teeth in their socket). Ulukhala can be compared to the ball ana socket type of joint.

**Samudga sandhi**

This type of joint are of box shaped or plate shaped (bowl). Examples of samudga sandhi are the joint found in amsapeetha (glenoid cavity of scapula), guda (coccygeal) and Nitamba (iliac) region. These jonts are compared to cavity joints.

**Pratar sandhi**

These are just plain type of joints wherein one surface of one bone articulate with the other surface of another bone. Example of pratar sandhi can be found in the joints of greeva vamsha (dorsal or thorasic vertebrae) inter vertebral joint. These joints are copared to plain joint.

**Tuna sevani sandhi:** These joints are in the form of stitches or suture between two bones, i.e. one feels as if two bones heve been stitched with other. Example of tuna sevani sandhi can be found in the joints of shiraha kapala (suture of the skull), and kati kapal (suture joints of pelvic bones). These joints can be compared to sutural joint.

**Vayasa tunda sandhi**

This joint is in the shape of beak of a crow. Example of vayasa tunda sandhi can be found in the joints of Hanu sandhi (temporo-mandibular joint). These joint can be compared to crow beak joint.

**Mandala sandhi**

These are round fixed and cartilaginous joints found in some structures of body. example of mandala sandhi can be found in Kantha (throat), Klomanadi (trachea)etc. these joints can be compared to the cartilaginous joint or annular joints.

**Shankhavarta Sandhi**

These joints are in the form and shape of spiral windings of conch. Example of sankhavarta sandhi can be seen in the joints of the srotra (ear) and sringataka regions. These joints can be compared with the spiral and cartilaginous or membranous and fixed joints.

**Number of joints in Whole body**

In our Ayurved classics different Acharyas have mentioned different no of sandhi. According to Acharya Charak in Charak samhita sandhis are 200, he only mentioned about no of Asthi sandhi, but didn't give description about features, characters, types and location of Asthi sandhis.[8] According to Acharya Sushruta, sandhis are 210 in numbers, which are responsible for various movements. He gives description about features, characters, types and location of Asthi sandhi. The distribution is as follows.[7]

| | |
|---|---|
| In the shakha (extrimities) | 68 |
| In the Kostha (trunk) | 59 |
| In jatrurdhava (head & neck) | 83 |
| Total no of sandhis | 210 |

**Number of joints and their location**

Acharya sushruta and in astang sangraha described about features, characters, sankhya (210) and location of asthi sandhies.[8] In modern science there are 360 joints in the body and proper description, situation & characters also present. So here we discuss about different

views of different acharya about asthi sandhi sharir shankhya, types, location and its detail description and co- relative study with modern science.

| Sandhis | Sushruta Samhita | Astang Sangrah |
|---|---|---|
| **Adho shakha 34** | | |
| Anguli | 3×4 = 12 | 3×4 = 12 |
| Angustha | 02 | 02 |
| Janu | 01 | 01 |
| Gulpha | 01 | 01 |
| Vankshana | 01 | 01 |
| **Urdhwa Shakha 34** | | |
| Kaksha sandhi | 01 | 01 |
| Kurpara sandhi | 01 | 01 |
| Manibandha sandhi | 01 | 01 |
| Anguli | 3 × 4 = 12 | 3 × 4 = 12 |
| Angustha | 02 | 02 |
| **Koshtagata sandhis – 59** | | |
| Kati Kapal/ shroni | 03 | 03 |
| Prushtavamsha | 24 | 24 |
| Parshawa | 24 | 24 |
| Uras | 08 | 08 |
| **Urdhwa jatrugata Sandhi 83** | | |
| Greeva | 08 | 08 |
| Kantha | 03 | 03 |
| Hridaya/kloma Nadi | 18 | 18 |
| Dantamula | 32 | 32 |
| Kakalaka | 01 | 01 |
| Nasa | 01 | 01 |
| Vatma Mandal | 02 | 02 |
| Ganda | 02 | 02 |
| Karna, Shankha | 04 | 04 |
| Hanu Sandhi, Bhru, Shankha upari | 06 | 06 |
| Shiraha Kapal | 05 | 05 |
| Murdha | 01 | 01 |

**Co-Relative study of the joint number with modern science:** As Ayurvedic Classics, in modern Anatomy there may be some difference in number of joint. In modern design anatomy, sthira sandhis are called immovable joints and the *chesta yukta* sandis are called movable joints. Acharya Sushruta not only described the position of 210 sandhis but the name and exact position of those sandhis have not yet been described. Here we discuss about no of joints according to Acharya Sushruta & its brief co-relation with modern science.

| Situation | sthan | No of Sandhi according to Acharya Sushruta.[9] | According to modern science[10] |
|---|---|---|---|
| Urdhwa Shakha 17 | kaksha sanshi | 1 | Shoulder joint |
| | Kurpar sandhi | 1 | Elbow joint |
| | Manibandh sandhi | 1 | wrist joint |
| | | | |
| | Anguli + Angustha sandhi | 5 | Meta carpo-phalangers joints |
| | | 9 | Inter phalangers joints |
| | Kul sandhi | 17 | Total |
| Adho Shakha 17 | Vakshan sandhi | 1 | Hip joint |
| | Janu sandhi | 1 | Knee joint |
| | Gulpha sandhi | 1 | Ankle joint |
| | Anguli + Angustha sandhi | 5 | Meta Torso-phalangers joint |
| | | 9 | Inter phalangers joint |
| | | 17 | Total |
| Madhya Sharir 59 | Kati Kapal 3 | 1 | Illio-Pubic Joint |
| | | 1 | Illio-Ishchium Joint |
| | | 1 | Ischio-Pubic Joint |
| | PrushthaVansh 24 | 1 | C7 to T1 |
| | | 11 | T2 to T12 |
| | | 5 | T12 to L5 |
| | | 5 | L5 to S5 |
| | | 1 | S5 to C |
| Parshwa | 24 | Costo-Vertebral Joint | Ribs articulate with body of vertebra (12) joint each side |
| Uras | 8 | Condro sternal joint | 1st to 7th Costal Cartilage Articulates with sternum. |
| | | 1 | Sterno-Clavicular joint |

| | | | |
|---|---|---|---|
| Head | 5 | Coronal Suture | Articulation between frontal and parietal bone |
| | | Inter Maxillary Suture | Articulation between the palatine process of right and left maxillae |
| | | Lamboid Suture | Articulation between occipital and parietal bone |
| | | Sagittal Suture | Articulation between two parietal bone |
| | | Metopic Suture | Articulation between two ossification centre of the frontal bone. |
| Sankha | 2 | Pterion. | Articulation between four bones the greater wing of sphenoid, frontal bone, parietal bone, squamous part of the temporal bone |
| Hanu | 2 | | Temporo-Mandibular Joint |
| Murdha | 1 | Top of the head | Vertex [highest point of the sagittal suture |
| Ear | 2 | | Incudo-malleolar joint<br>Incudo-stapedial joint |
| Teeth | 32 | | Socket of Teeth |
| Nose | 1 | | Inter nasal suture |
| Vatma Mandal | 2 | Lateral Angle | Outer Canthus |
| | | Medial Angle | Inner Canthus |
| Griva | 8 | 2 | Occipito-Atlanto Joint |

| | | | |
|---|---|---|---|
| | | 1 | Atlanto-Axial joint |
| | | 5 | C2 to C7 |
| Nadi | 18 | | C-shaped Cartilaginous joints in Trachea |
| Kantha | 3 | 1 | Thyro-Cricoid Joint |
| | | 1 | Thyro-Arytenoid Joint |
| | | 1 | Crico-Arytenoid joint |
| Ganda | 1 | 1 | Zygomatico-Maxillary Suture |
| Kakalak | 1 | Uvula | Bucco-Pharyngeal Joint |
| Brow | 2 | | Fronto-Maxillary Suture |
| Shankha upari | 2 | | Fronto-Zygomatico-Sphenoidal Suture |

## DISCUSSION

Joints are not only of anatomical and structural importance; their knowledge is also needed for medicinal science. Joint disorders are the most common life style disorders encountered in clinical practice. Their incidence is increasing constantly keeping in pace of evolution. *Sandhis* are abodes of Kapha, mainly Sleshmaka kapha, which helps keeping them functional and integrated along with providing good lubrication. All types of sandhis are covered by *sleshmadhara kala,* whereby secreted *sleshma,* which nursing sandhis. *Sandhis* are also *marmas* or important vital points or delicate or sensitive structures, the injury of which leads to death or due to damage or degeneration lead to deformity.[11] According to Acharye sushruta sandhies are divided into two kinds Immovable (synathrosis) and movable (diathrosis) Based on structure and shape of joints, sandhis are eight types. As like Sushruta Samhita synovial joints covered by synovial membrane, synovial fluid secreted by synovial membrane, it lubricates the articular surface of joint, which it is primarily responsible for maintaining normal function of joints. In different ayuvedic samhita's different views about sandhies. In charak samhita according to Acharya charak shankhaya of ashthi sandhies are 200 but he didn't give description about features, characters and location of asthi sandhies. Acharya sushruta and in Astang sangraha described about features, characters, sankhya (210) and location of asthi sandhies. In modern science there are 360 joints in the body and proper description characters also available. So here we discuss about different views of different acharya about asthi sandhi sharir shankhya, types, location and its detail description and co-relative study with modern science. Like the vedic literature, in modern anatomies, the number of joints is the only the difference of opinion. They gave cartilaginous joints on the basis of they told the *tarunasthi*. Modern anatomy has different joints of different bones, but Acharya Sushruta has taken only one joint of many bones.

## CONCLUSION

The various classical texts of *Ayurveda h*ave defined *sandhis* are meeting place of two or more *Asthis.* Even in modern anatomy, it is said to be a combination of two or more sowing of the joint. As like Ayurved classics even in modern anatomy there is number of doubt about the number of joints. In modern science the number of joints was given 360. In this paper, we described the opinion of different *Acharyas a*bout the *sandhis* and made it possible to make a combination with the joint described in modern anatomy. After explanation, the description of type and location of Acharya Sushruta and the Modern Anatomy joint is almost one, just like in modern anatomy the joints were split into two types the immovable or sthir sandhi and movable or chesta yukta sandhi. He again wrestled it in eight types just like synovial type of joint. Then result is we found description of Acharya sushruta is most appropriate in relation to the sandhis received by other classics. Description of acharya sushruta is very close co-relate with modern science. Their types, location, characters and features of sandhis are closely matched with modern description, variations only in numbers, because Acharya Sushruta has taken only one joint of many bones.[12]

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