



ORIGINAL RESEARCH PAPER

Ayurveda

EXPLORING THE CONCEPT OF *DANTA SHARIR* IN AYURVEDA AND ITS ASSOCIATION WITH MODERN SCIENCE - A REVIEW

KEY WORDS: *Danta, Ruchakasthi, Asthi, Ayurveda*

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ABSTRACT

The concept of *Danta shareer* is one of the unique concepts which is explained in the Ayurved *Rachana Shareer*. *Danta* (Teeth) are *Parthiv* structures in the body which are included under the classification of *Asthi* as *Ruchakasthi* by *Acharya Sushrut*. The *Danta* are considered to be one of the milestones of child growth. The modern science has described the eruption of teeth in a year wise manner. Present review article can be useful to comprehend literal aspect of *Danta shareer* in Ayurveda as well as modern science. The relevant literature related to topic was critically reviewed from all available literary sources. There is description of *Danta* and its associated diseases in Ayurved compendia but very less and scattered manner. The pattern of description of *Danta* in Ayurved has similarity at some places with contemporary science like as in Ayurved four types of *Danta* are mentioned similarly in modern dentistry they have classified Teeth in four types. However it can be said that concept of dentistry was fully developed and well practiced in ancient *Ayurveda*.

INTRODUCTION:

Ahar (diet) is one of the *Upstambh* (basic component) for maintaining health as it aids *Dhatuposhan* (tissue nourishment).^[1] *Ahar* taken is converted into the *Ahara Rasa* after proper digestion. The process of digestion initiates at the oral cavity where the *Danta* (teeth) plays a significant role in chewing. Oral health is very important and critical for one's overall health. Yet it is often neglected. The *Danta* are considered to be one of the milestones of child growth. The modern science has described the eruption of teeth in a year wise manner.

Danta are *Parthiv* structures in the body. Which are included under the classification of *Asthi* as *Ruchakasthi* by *Acharya Sushrut*.^[2] The elaboration of *Danta/Ruchakasthi* is not mentioned in the *Bruhatrayee*, while the *Dantagat rogas* have been explained by *Sushrut* in *Uttartantra*.

On literature search a short explanation of *Danta* is found in *Kashyap Samhita*. Though there is a special mention about *Dantangatrogas*, structural aspect of *Danta* is not elaborated in it.^[3] It is an effort to explore the concept of *Danta Shareer* given in Ayurvedic text and its correlation with modern science.

AIM & OBJECTIVES:

To study the *Danta Shareer* in Ayurved classics as per ayurveda text & modern Anatomy.

MATERIAL AND METHODS:

The relevant literature related to the topic was critically reviewed from the *Bruhatrayee*, *Laghutrayee*, classical Ayurvedic texts, research journal and relevant internet resources.

Review Literature:

Nirukti (Creation) of word *Danta* : According to *Sabdasthoma-mahanidhi* and Sir MM Williams, word *Danta* is derived from the root '*DAM*' which when suffixed by '*TAN*' gives rise to the word *Danta*. The literary meaning of *DAM* is a tooth, tusk, fang (two long sharp upper teeth in snakes) and the literary meaning of *TAN* is Continuation, diffusion or propagation.^[4]

Synonyms of *Danta*: Various synonyms are given for *Danta* in context to its shape, structure and functions.

SN	Synonym	Meaning
1	<i>Dashana</i>	To bite, it can be used for cutting the food & tool for self protection
2	<i>Radana</i>	Sharp pointed edged structure and tearing function of teeth, particularly canine tooth
3	<i>Khadana</i> ^[5]	to denote the grinding function
4	<i>Dvija</i> ^[6]	As teeth appears twice in life they are called <i>Dvija</i> (initially the deciduous teeth and consecutively the permanent set)

Embryology of teeth:^[7] Stages of tooth development Based on the shape of enamel organ during the development of tooth, developmental stages of the tooth are divided into three morphological stages.

- 1) Bud stage
- 2) Cap Stage
- 3) Bell stage - A) Early
B) Advanced

Table: Tooth formation- Bud & cap Stage

Bud Stage	Cap Stage
- Round or ovoid enamel organ. - Peripheral cuboidal and central polyhedral cells. - Dental papilla adjacent to enamel organ. - Dental follicle surrounding dental papilla and enamel organ.	- Cap shaped enamel organ. - Three layer in enamel organ - inner enamel epithelium, stellate reticulum and outer enamel epithelium. - Dental papilla with condensation of ectomesenchyme and budding capillaries. - Dense fibrous dental follicle.

Table: Tooth formation- Early & advanced Bell Stage

Early Bell Stage	Advance Bell Stage
- Enamel organ having bell shape - Four layers in enamel organ - inner enamel epithelium, stratum intermedium, stellate reticulum and outer enamel epithelium. - Dental papilla with peripheral cells differentiating to odontoblasts - Distinct dental follicle	- Dentin and enamel formation. - Four distinct layer of enamel organ, collapse of stellate reticulum. - Distinct layer of odontoblast. - Distinct dental follicle.

Dantotpatti Prakriya (physiology of teeth eruption):

This has been clearly mentioned by Vagbhata in A.S. Teeth

originates from *Ashti* (bone) and *Majja* (bone marrow) *Dhatu*. Since, they are of incomplete strength during first four month of life, these teeth fall off and new teeth erupt. Again, there is no re eruption of new teeth in the elderly because of the inadequacy of these *Dhatu*s.^[9]

Formation of Dentition:

Human have two sets of teeth in their lifetime. The first set of teeth to be seen in the mouth is the primary or deciduous dentition which begins to form prenatally at about 14 weeks in uterus and is completed postnatal at about 3 years of age. In the absence of congenital disorders, dental disease or trauma, the first teeth in this dentition begin to appear in oral cavity at the mean age of 6 and the last emerge at the mean age of 28 ± 4 months.^[9]

Danta-vikas (tooth development):

According to Ayurveda, six factors are very essential for the formation and development of foetus.^[10] Out of which *Danta* are considered as *Pitruja bhava*. All body structures which are *Sthira* (firm consistency), *Kathina* (hard), *Ruksha* (dry) are considered as *pitruja-bhava*.^[11]

At the time of birth, tooth are not fully developed therefore Ayurveda called them as a *Jatasya uttarkalaja* (developed later in life) structure. Various stages of tooth development are described by Kashyapa. These stages are *Sukshma* (tooth germ stage), *Murtibhava* (bell stage), *Udbheda* (tooth eruption), *Patana* (falling of deciduous teeth), *Punarudhbhava* (eruption of permanent set) and *Sthiti*. Development of teeth, dental diseases, health of teeth, is influenced by various factors, such as *Jati* (race), *Matruja Pitruja* (hereditary), *Sva-karmavishesha* (socioeconomic status).^[12]

Tooth development begins in intrauterine life. The *Shonita* which appears in the pits of gums further develops as a tooth.^[13] *Dantodbheda* (teething) is a process in tooth development in which the teeth enters the mouth and become visible.

Ayurveda has stated some rules related with tooth eruption. First rule states that the month at which tooth appears, they will take same days to erupt, means if *Danta* appears in the fourth month of age of child, then within four days they will erupt. Second rule states that the month, at which teeth erupt, it will take same number of years to replace by the permanent set of teeth.^[14] Teeth eruption is very painful in male child as compare to female child, because male child have hard consistency of gums, female child having smooth one.^[15] Teeth which erupt at the age of eighth month of child is considered as a *Danta sampad* (ideal healthy teeth). If teeth erupt before eight year, they will suffer from *Daurbalya* (weakness), *Amaybhahulya* (diseased), *Vaivarnya* (discoloration), *Chunadanta* (dental caries).^[16]

Also, Vagbhata has explained development of teeth. The concept of Vagbhata regarding genesis of teeth is more nearer to the current science. He opines that *Dhatubija* is basically responsible for further development of tooth.^[17]

Dosh-Dhatu Relation of Danta:

Danta is considered as *Asthidhatu*. Out of five types of *Asthi* (bones), *Danta* is known as '*Ruchakasthi*' because only after grinding the food and mixing of *Bodhaka kapha* (saliva) we could able to sense the taste of food.^[18] Chewing allows us to feel the shape or texture of food, making one more sensitive to the taste of food.

Acharya set a direct relation between *Asthidhatu* and *Danta*. But, *Sharangdhara* had modified the concept, he described *Danta* as the *Upadhatu* (by product) of *Asthi* he also stated the similarity and difference between *Danta* and *Asthi*.^[19] This opinion coincides with the modern anatomy. It states that

teeth and bones are not same. But it admits that there is some interrelationship between the osteoporosis and teeth loss.^[20]

Number:

Total number of *Danta* are thirty two, out of which twenty four teeth are *Dvija* (milk teeth) and rest of eight teeth are *Sakrutjjata*, which erupts only once in life.^[21]

Danta Prakara (Types of dentition):

Kashyap has mentioned four types of dentition.^[22] **Samudga:** A joint with socket, like a cup. These types of teeth develop in the condition of *Kshaya* (malnutrition) of child. These teeth may fall very frequently.

Samvrita: These are inauspicious and remain dirty.

Vivrita: These types of teeth, cause excessive salivation, because these are not fully covered with lips, there are of many chances causing diseases of teeth to such individuals.

Danta Sampata: These are auspicious teeth having all the characteristics of healthy teeth.

Period of teeth eruption and its effects:

Kashyapa narrate that if eruption of teeth takes place before the age of 8th month, there are always chances of complication in teeth and these are enumerated as follows:

Table: Effect of month wise dentition in child according to Ayurved

SN	Period of Dentition	Effects
1	4 th Month	Weak, decay, early afflicted with so many diseases
2	5 th Month	Shaky, morbid sensitivity and easily afflicted with various diseases
3	6 th Month	Inverted, dirty, discolored, susceptible for dental caries
4	7 th Month	Two pocket split, stripped, broken, dry, irregular and protuberant
5	8 th Month	Best qualities, completeness evenness, compactness whiteness, unctuousness, smoothness cleanliness.

TYPES OF TEETH:

Kashyap said, out of thirty two teeth in human beings. Eight erupt once and become the teeth mounted in own/original (roots), so rests are *Dvija*. In what so ever months the teeth are inseminated; in same number of days appear. After birth in what-so ever month the teeth appear, fall and reappear in the same year.^[23] He mentioned the four types of *Danta*, based on their function and shape.^[24]

- 1) *Rajdanta* - The upper and lower front four teeth, which cut the food with their sharp edge they are sacred, so in the breakage of these, one is unfit for homage.
- 2) *Vasta* - At the corner of the mouth are the *Vasta* teeth, these teeth have one cusp or pointed edge. And are used for holding or grasping the food and are very strong and stable teeth.
- 3) *Damstra* - Behind the *Vasta*, are the *Damstra* which are designed for holding food like the canines, but they also function to crush the food.
- 4) *Hanavya* - The teeth farthest back in the mouth are called as *Hanavya*. These have broad chewing surface with four or five cusps and are designed for grinding the food.

Types of teeth^[25] - According to modern dentistry

- 1) Incisors - Central & Lateral incisor
- 2) Canine
- 3) Premolar - 1st & 2nd premolar
- 4) Molars - 1st, 2nd & 3rd molar

MEASUREMENT:

The length of human tooth is two *Anguli*, one *Anguli* teeth is enclose within the alveolar sockets and covered by *Dantamansa* (gums) rest remaining one *Anguli* tooth is projecting in the oral cavity.^[26] *Dantamansa* are main support for teeth.^[27] According to modern anatomy the teeth vary from canine to molars, but average length of human teeth is around 20mm of which, the crown is measured around 7 mm and the root on average is around 13 mm.^[28]

Criteria for Prakrut (healthy) Danta:

Healthy and normal teeth are called '*Danta-sampat*'. Kashyap has stated the criteria that the teeth which are *Poorna* (thirty two in number), *Sama* (normal length), *Ghana* (compactly arrange), *Shukla* (pearled white), *Snigdha* (shinning), *Slakshna* (smooth), *Nirmal* (clean), *Niramaya* (without any dental disease) are called perfectly healthy teeth.^[29] Any deviation from above criteria are called *Aprakrut Danta* (abnormal/diseased teeth).

Danta as Pratyanga:

Yogratnakar has mentioned the seven *Pratyanga* (subdivision) of *Mukha* (mouth), in which he mentioned *Danta* as one of the *Pratyanga*.^[30]

Dantasandhi:

According to structural classification, the joint between *Danta* and *Dantamula* is said to be *Ulukhala sandhi* (ball and socket type) and functionally it is *Sthira* (synarthrosis) *sandhi*.^[31]

Instead of ball shaped convex rounded surface, the tooth have conical process or peg which fits into a socket of another bone therefore modern anatomy considered it as an peg and socket joint.

Premature Eruption of Danta:

Vangasena has different concepts regarding the effects of early dentition and family members of the child are affected, if dentition occurs before the age of 8th months. The child, who has tooth eruption ranging from one to seventh month of age, is considered to be inauspicious for father, mother, siblings and all family members including servant and teacher etc. There is no any specific cause of premature eruption of teeth which is mentioned in modern literature. However, few have considered that endocrine factors may be involved because premature eruption of teeth sometimes occurs in infant with congenital adrenal hyperplasia.^[32]

Diseases Related With Danta:

Sushruta described various types of *Danta vyadhi* and their *chikitsa*. There are fifteen *Dantamulgat Vyadhis* i.e. *Shitad*, *Dantapupput*, *Dantaveshtak*, *Shaushir*, *Mahashaushir*, *Paridar*, *Upakush*, *Dantavaidarbhya*, *Vardhan*, *Adhimansa*, *Dantanadi* (*Tridoshaj*) in *Nidan sthan* and eight *Dantaroga* in *Chikitsasthan* i.e. *Dalan*, *Krumidant*, *Dantharsh*, *Bhanjanak*, *Dantasharkara*, *Dantakaplika*, *Shyavadanta*, *Hanumoksh*.^[33]

Yogratnakar also described the *Dantaroga* and its *Samanya chikitsa* under *Mukharoga Nidan* similar to that of Sushruta. He described eight *Dantaroga* in *Chikitsa sthan* and 16 *Dantamulgata vyadhi*; *Khallivardhan*, *Dantavidradhi* and *Karal* in addition to Sushruta.^[34]

Sharangdhara explained 13 *Dantamulgat Vyadhis*; *Vidarbha*, *Adhidanta*, *Nadivran* & *Dantavidradhi* in addition to Sushruta.^[35]

Dental Anatomy:^[36]

Tooth is a hard calcified structure found in the jaws or mouth of many vertebrates and that function is chewing.

Functions of teeth:^[37]

The function of teeth depends on the types of the teeth.

- 1) Incisors- To cut the food
- 2) Canines- To tear the food, i.e. tearing

- 3) Premolars- To crush the food
- 4) Molars - To grind the food

HISTOLOGY OF TEETH:^[38]

A tooth is made up of the enamel, dentin, pulp cavity and cementum.

1) Enamel - White (translucent), hard and resistant layer covering the crown of the tooth, protecting the tooth from mechanical and chemical attack. The enamel rods that run parallel to each other, projecting perpendicularly from the dentine surface. Enamel meets the dentine at the enamel-dentin junction (EDJ) and meets the cementum at the cemento-enamel junction (CEJ).

2) Dentin - It is hard, yellowish material that lies underneath the enamel, surrounding the pulp chamber of the tooth & sensitive to stimuli. Surrounds the entire nerve/ pulp of the tooth. Forms the pulpo-dentin organ of the tooth with the pulp.

3) Pulp Cavity- Dental pulp is a pink and soft organ consisting connective tissue, blood vessels, nerve axons & involved in dentinogenesis. Crown of the tooth contain the coronal pulp while radicular pulp extends from the cervical part of the crown to the apex (tip) of the root.

4) Cementum - Relatively soft bony tissue that covers the root surface. Meets the enamel in a line surrounding the tooth called the cement-enamel junction. Attached to the periodontal ligament to be attached to the bony socket of the alveolar bone supporting the tooth.

Causative factor of Dental caries:^[39]

Tooth location - Decay most often occurs in back teeth (molars and premolars). These teeth have lots of grooves, pits and crannies and multiple roots that can collect food particles.

Certain foods and drinks - Foods that cling to teeth for a long time; such as milk, ice cream, honey, sugar etc are more likely to cause decay than foods that are easily washed away by saliva.

Frequent snacking or sipping - When steadily snack or sip sugary drinks, give mouth bacteria more fuel to produce acids that attack teeth and wear them down.

Bedtime infant feeding - When babies are given bedtime bottles filled with milk or other sugar-containing liquids remain on teeth for hours while they sleep and causes baby bottle tooth decay.

Inadequate brushing - If teeth are not clean properly after eating and drinking, plaque forms quickly and the first stages of decay can begin.

Not getting enough fluoride - Fluoride, a naturally occurring mineral, helps prevent cavities and can even reverse the earliest stages of tooth damage.

Younger or older age - Cavities are common in very young children and teenagers. Older adults also may use more medications that reduce saliva flow, increasing the risk of tooth decay.

Dry mouth - Dry mouth is caused by a lack of saliva, which helps prevent tooth decay by washing away food and plaque from teeth.

Heartburn - Heartburn or gastroesophageal reflux disease (GERD) can cause stomach acid to flow into mouth (reflux), wearing away the enamel of teeth and causing tooth damage.

Eating disorders - Anorexia and bulimia can lead to tooth erosion and cavities. Stomach acid from repeated vomiting (purging) washes over the teeth and begins dissolving the enamel. Eating disorders also can interfere with saliva production.

Preventive aspect of dental caries:

1. *Danta Dhavani* (brushing): *Ayurveda* recommends chewing sticks in the morning as well as after every meal to prevent diseases. *Ayurveda* insists on the use of herbal brushes, approximately nine inches long and the thickness of one's little finger. These herb sticks should be either "*Kashaya*" (astringent), "*Katu*" (acidic) or "*Tikta*" (bitter) in taste. The method of use is to crush one end, chew it and eat it slowly.^[40] Present-day research has shown that all the chewing sticks described in ancient *Ayurveda* texts have medicinal and anti-cariogenic properties.^[41]

2. *Jivha Lekhana* (tongue scrapping): It is ideal to use gold, silver, copper, stainless steel for the scrapping of the tongue. Tongue scrapping stimulates the reflex points of the tongue & remove bad odor (halitosis). Improves the sense of taste, stimulate the secretion of digestive enzymes. Removes millions of bacteria growth (approximately 500 varieties) Clinical evidence also shows that use of tongue scrapers on a regular basis, has a significant improvement on eliminating anaerobic bacteria and decreases bad odor.^[42]

3. *Gandusha* (gargling) or oil pulling: Oil pulling is an ancient *Ayurveda* procedure that involves swishing oil in the mouth for oral and systemic health benefits. It is mentioned in the *Ayurvedic* text *Charaka Samhita* where it is called *Kavala* or *Gandusha* and is claimed to cure about 30 systemic diseases. Oil pulling therapy is very effective against plaque induced gingivitis both in the clinical and microbiological assessment.^[43]

4. Tissue regeneration therapies: In *Ayurveda*, the well-known herb, *Amla* (*Phyllanthus emblica*) is considered a general rebuilder of oral health. *Amla* works well as a mouth rinse as a decoction. One to two grams per day can be taken orally in capsules for the long-term benefit to the teeth and gums. *Amla* supports the healing and development of connective tissue when taken internally.^[44]

DISCUSSION:

In *Ayurveda* there is description of *Danta*, in scattered manner. There are five types of *Asthi*. *Danta* are carried out under the type of *Ruchakasthi*. *Vagbhata* (sangraha) described the *Utpatti* of *Danta* from *Asthi* and *Majja Dhatu*. He was also said that as the age advances, *Kshaya* of these *Dhatus* occurs so; there is no re-eruption of new teeth in aged. Thus there is role of *Asthi* and *Majja Dhatu* in the formation of *Danta*. *Kashyapa* have mentioned 32 numbers of teeth. He has classified them as *Sakrijjata* and *Dwijja*. As per description the *Sakrijjata* teeth can be termed as premolar teeth as these appear only once in life. Also *Sakrijjata* can be called as permanent teeth. *Kashyap* has given their number as per modern science, that is eight (8). He has described remaining *Danta* as *Dwijja* that which falls off and erupt again. These can be correlated with deciduous teeth which are incisor, canine and molar. He has termed types of teeth as *Rajadanta*, *Vasta*, *Danshra* and *Hanvya*. As per the description given by him *Rajadanta* can be correlated with central incisor, *Vasta* can be correlated with lateral incisor, *Danshra* can be correlated with canines and remaining *Hanvya* can be considered with as molar and premolar.

According to *Kashyapa* has described 3 stages of *Dantopatti*, these are *Nishikt*, *Murtimaan* and *Udbhedan*. These stages of development can be correlated with Bud stage, Cap stage and Bell stage respectively. Two *Anguli* length of *Danta* given by *Acharya* *Sushruta* approximately measures to be 24 mm, this length co-relates with the length of central incisor teeth.

Kashyapa has also described the factors that affect the eruption pattern of teeth such as eruption of teeth earlier in female child as compare to male child. Also, in modern sciences there are various researches. Due to changes in day to day life style, the superiority of human health is falling.^[45]

This shows influence of various factors on eruption of teeth which resembles with factors given in *Ayurvedic* *samhita*. *Dhatubija* can be very well considered as tooth buds, localized proliferation of cells in the dental lamina from which mesenchyma developed into the deciduous teeth. Overall, this shows bird's eye view of various *Acharya*, though they had lack of instruments at that time.

CONCLUSION:

Concept of dentistry was fully developed and well practiced in ancient *Ayurveda*. *Acharya Kashyap* gives the detailed explanation on anatomical and clinical aspects of dentistry such as dentition, types of teeth, structure of teeth and significance of them along with non-occurrence of teeth. This description is quite similar to modern dentistry. *Acharya Vagbhata* has also gives some valuable information about dentistry like, development of teeth, anatomy of teeth, pathogenesis and different disease conditions related to teeth. *Acharya Vangasena* has also given few important thoughts related to dentistry. Thus anatomical information of dentistry such as types of teeth, structure of teeth etc, pathological conditions and its management through *Ayurveda*, all are very valuable information explained in *Ayurvedic* classic.

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