ABSTRACT:
Interpretation of Ayurvedic terminologies in contemporary science remains confusing in many contexts. Dhamani is one among such terminologies. Sushruta, the father of surgery, clearly explained the constitution of human body from Twak (skin) to Sookshma Srotas (minute channels) and their enumeration, in which Sira (vein), Dhamani (artery), Srotas (capillaries) are the channels for the transportation of Rasadi Dhatu (nutrient components). They are interpreted as blood vessels, lymphatic channels and nervous entity. In many context, Dhamani falls under the category of vascular entity. Mooka (dumb), Minmina (nasal twang) & Gadgada (stammering) manifest due to involvement of Shabdavahini Dhamani; thus it is considered as neurological entity. There arises confusion whether to consider Dhamani as neurological entity or vascular entity. Hence this study is aimed to emphasize on Dhamani as a specific anatomical structure by critically reviewing all possible literature, both as per Ayurveda and contemporary science.

Keywords: Dhamani, Srotas, Sira, Rasa, Artery, Nerve

INTRODUCTION: Dhamani is a structure mentioned in Ayurvedic classics which carry Rasa all over the Sharira and maintains the Poshana (nutrition) of the Sharira. Sushruta enumerated that there are seven hundred Sira (veins), twenty four Dhamani (arteries) and twenty two Srotas (capillaries). The number of the Sookshma Sira and Dhamani are same as that of the hair-follicles. Sushruta has used the word Dhamani for some of the Mula Sthana (root of origin) of Srotas. It is one of the Pitruja Bhaava. Further Charaka has stated that the channel which carries the related content (Dravya) with Dhmana(pulsation) has been named as Dhamani, the channel through which the related content flows freely without much pressure has been named as Sira and that which helps in Sravana (secretion) named as Srotas.

REVIEW OF LITERATURE: Concept of Dhamani Etymological meaning of Dhamani is derived from Sanskrit term- “Dhambate Iti” that which expands. Charaka quotes “DhmanaatDhamnyaha” - the one which has the characteristic features of pulsation is Dhamani. Chakrapani commentary on this, states that “Dhmanat Pooranaat Baahyena Rasaadenetyarthaha” – the one which is hollow & filled with Rasadi is considered as Dhamani. The characteristic features of the term Dhmana and poorana should be understood. As per the commentary of Chakrapani Dhmani does Poorana(fills) Karma, Srotas (capillaries) does the Poshana Karma and Sira (vein) does Deshantara Gamana karma (taking away from the site). As per Vagbhata - Sira, Dhamani and Srotas are considered as structure with lumen (Sharira Chidra). Sharangadhara has used the term Dhamani in Naadi Parisksha Vidhi (pulse examination) and exact position has been mentioned i.e.at the root of Kara Angusha (root of thumb). Pulsatile function of these Naadi is the Jeevasaakshi.
Moola of Dhamani: In the context of Sharira Sankhya Vyakharana, Dhamani originated from Nabhi as Moola. In the context of Shonitavarniya Adhyaya after the formation of Rasa it enters the Hridaya (heart) from Hridaya Dhamani emerges and helps in conducting Rasa throughout the Sharira. Arthedashamahaamooliyam Adhyaya of Charaka says that Dhamani Moola is Mahat, for this Chakrapani commented Mahat is Hridaya.

Review related to classification and enumeration of Dhamani

Dhamani are classified into ten Urdhwaga, ten Adhoga and four Tiryagaga. Urdhwagata Dhamani carry out special functions like Shabda (sensation of sound), Sparsha, Roopa, Rasa, Gandha, Prashwasa (inspiration), Uchwasa (expiration), Jrimbha (yawning), Kathita (speaking), Rudita (weeping) by which it does the Shareera Dharana. When it reaches the Hridaya each divides into three, thus becoming thirty, out of which two each for conducting Vata, Pitta, Kapha, Rasa, Rakta, Shabda, Sparsha, Roopa, Rasa, Gandha, Bhashya (speaking), Gosha (loud voice), Swapiti (sleep) and Pratibhodana (wakefulness) by which structures which lie above Naabhi (umbilicus) like Udara (upper part of abdomen), Parshwa (flanks), Prista (back), Uraha (chest), Skandha (shoulder), Greeva (neck), Baahu (arms) are supplemented and supported. Adhoga Dhamani carries out the function of Vatavahana (flatus), Mootravahana (micturition), Purishavahana (faeces), Shukravahana (ejaculation) and Arthavavahana (menstruation). As it passes downwards it is said to divide into 3 each thus into 30 branches. Further they divide into two each for carrying Vata, Pitta, Kapha, Rasa, Shonita, Annavaha (solid food), Toya (liquid food), Mootra, Varchonirasana (elimination of feces), Shukrapradurbhaava (production of semen), Shukravisarjana (ejaculation of semen) in male, Arthava Pradurbhava (production of menstrual blood) and Arthava Visarjana (menstruation) in female and remaining eight Dhamani moves Tiryagata (laterally) and supplies the channel of Sweda by this way Adhoga Dhamani does the Dharana of below the umbilicus like Pakwashaya (intestine), Kati (hip), Mootra, Purisha, Guda (anal region), Basti, Medhra (penis) and Sakthi Sustained and maintained. Tiryagata Dhamani divides into hundred each further re divide into thousand and there on into minute branches and looks like Gavakshitha Vibadda (mesh like appearance), their ends are attached to Romakoopa (hair follicles) for Vahana (conduction) of Sweda (sweat), for Tarpana (nourishing) of Rasa both inside and outside through this which Abhyanga (massage), Paraishka (pouring), Avagaha (sudation) and Lepa (anointing) of drugs get Vipakwa. By nourishing the Twak (skin) the Tiryagata Dhamani are responsible for Sukha and Asukha Sparsha.

The nomenclature given for Dhamanis like Shabdavahin (sense of hearing), Rasavahini (sense of taste), etc confuses a reader whether to consider it under vascular structure or under neuronal structure. This article is intended to throw a light on the Dhamani.

Srotomoola as Dhamani: According to Sushruta in the chapter of Dhamani Vyakharana he explained the Moola Sthana of Srotas, as they are Pranavaha Sroto Moola is Rasavahini Dhamani, Annavaha Srotomoola is Annavhini Dhamani, Rasavahiva Srotomoola is Rasavahini Dhamani, Raktavaha
Srotomoola is Raktavahini Dhamani, Mamsavaha Srotomoola is Raktavahini Dhamani and Arthavavaha Srotomoola is Arthavavahini Dhamani. 

**Dhamani as Marma:** Both the Vagbhata classified Dhamani as a separate Marma based on structure. Accordingly there are nine Dhamani Marma. They are Guda Marma and Shringhataka Marma injury of which leads to Sadhyomarana (sudden death), Apasthambha Marma injury leading to Shonita Poorna Koshtata (blood filled lungs), Shwasha (breathlessness) and Kaasa (cough), Vidhura Marma leading to Badhirya and according to one of the Dhamani Praticahya (atherosclerosis) explains mode of action of Guna (quality) of a Dravya by their own Veerya (potency) enters the Hridaya and following the Dhamani reaches the Shhoola Srotas (big channels)22. Dhamani Shaitilya is one of the Mamsa Kshaya Lakshana according to Sushrutha23. Dhamani Praticahya (atherosclerosis) is one of the Shleshmaja Nanatmaja Vikara according to Charaka24. Sira Snaayu Dhamani Spandana is one of the Vata Prakopaka Lakshana according to sushrutha25. Mooka Minmina Gadgada Samprapti explains Vruddha Vata does the Avarana (blocks) of Kapha enters the Shabda Vahi Dhamani and produces the disease26. As per Pakshagata Samprapti, Vrudda Vata enters the Urdhvaga, Adhoga and Tiryagata Dhamani leading to Vyadhi27. In the context of Arshas (hemorrhoids) the Vrudda Dosha along with Shonita enters the Pradhana Dhamani and produces Arshas28. Charaka in the Pandu (anemia) and Visarpa (herpis) Roja the Prakupita Dosha enters the Dhamani and produce these diseases29.

**DISCUSSION:**
As per the Nirukti Dhamani is an anatomical tubular structure having the characteristic features of Dhmana (pulsation) and also responsible for conduction of Rasaadi Dhatu, only the artery having the pulsation to assess the health of a person, even though nerve conducts the impulse that cannot be felt directly .

The word Dhmana signifies the content which is propelled forward with some pressure or rhythmic force. This refers to an organ which is exclusively pumps an amount of Poshaka Dravya (nutrient fluid) with graded pressure & force required for supplementation of Rasadi Dhatu (Sookshma Dhatu) to each and every cellular component of the body based on their need. Hence the organ which is responsible for conducting nutrient fluid along with the Pranavayu (po2) is Ursrathitha Hridaya (heart). Hridaya is referred to be the site for Para Ojas, Prana, Vyana, Manha, Moola for Dasha Dhamani and Avalambhaka Kapha. Emerging from Hridaya Dhamani is said to carry Ojas which is having an important role in maintaining immune response of the body. Hence Dhamani is said to be related with Hridaya conducting Rasa Rakta, along with Prana Vayu by which Shareera Poshana will occur.

The structure which can be identified at the root of thumb having palpable pulsation is radial artery which can be taken as suitable tubular structure conducting arterial blood (nutritional fluid) and the frequency of pulsation, number of pulsation and type of pulsation which is described by Sharngadhara like Sarpavat (serpent), Mandookavat (frog), and Hamsavat (swan) goes in favor of Dhamani as artery. Further the quality of pulsation is the sympathetic neuronal control of smooth muscles
in the wall of the artery along with volume of cardiac output /min. This is not felt in vein and this may be the reason Acharya have defined the Sara Guna rather than Dhmana. In Circulatory system of human body, artery carries the oxygenated blood to the capillaries, capillaries supplies to each and every cell. The vein receives the deoxygenated blood. Nabhi is Moola, Nabhi is considered in relation to embryological development of fetus and vascular structure as been defined related with fetal nourishment. This is justifiable by observing the order of the chapter Sharira Sankhya Vyakharana just after the Garbha Vyakharana.

Discussion related to Classification and terms used in identification and understanding of Dhamani.

By observing the description regarding classification of Dhamani it shows that the direction of Dhamani coursing in upward direction and downward direction divide and redivide into branches resembles that of large arteries related with heart passing upwards supplying upper part of the body and the related structures. The nomenclature given to these Dhamani by Acharya Sushruta seems to be based on the functional specificity of particular structure and its blood supply like the organ related with production of sound (Shabda), speech, vision etc.

This description also stands for Adhogha Dhamani based on functional importance of particular organ/structure and the related blood supply as well. Further the term Tiryagata Dhamani has been explained in relation to spreading of blood vessel to the body wall including the modified body parts in the form of upper limb and lower limb ultimately ending in the form of arterial plexus by anastomosis of cutaneous arteries. Each and every root of hair follicle in the skin needs blood supply which is supplemented by this Tiryagata Dhamani along with nourishing the skin.

While explaining the Moolasthan of Srotas, Acharya have included the conducting channels of a particular Dravya related with specific Srotas. For example while explaining Arthavavaha Srot as Garbhashaya and Arthavahini Dhamani clears that Garbhashaya is the organal entity responsible for growth of fetus etc, while Arthavahini Dhamani in the wall of Garbhashaya helps in vascular supply needed for the function of female reproductive organ. Dhamani Marma as per Vagbhata is based on injury related with vascular component. This goes in favor of blood vessels related with Guda (anal region) and Shringhataka (cavernous sinus) Marma which are categorized under Sadyopranahara Marma and Viddha (injury) leads to hypovolemia due to hemorrhage or loss of blood causing death. Shin-go oya et al study shows that injury to anus leading to hypovolemic shock.

Apasthambha Marma injury leads to haemothorax. The vital area related with Vidhura marma includes facial nerve and stylomastoid artery along with other branches of external carotid artery supplying to various parts of ear and which causes conduction deafness this goes in favor of both neuronal and vascular entity.

If blood supply to the nerves is not proper, the nervous function is altered. This may be the reason for categorizing Vidhuraas Dhamani Marma. Study conducted by Nadir Yildirm shows that local and systemic vascular involvement is responsible for hearing impairment.

Sushruta explains Dhamani Gata Vata Roga are Gridharsi (sciatica), Vishwachi (brachial neuralgia), Kroshtuka Shirsha (knee joint swelling), Khanjha (limping),
Panghula (lameness), Vatakantaka, Padadaha, Padaharsha (tingling sensation of foot), Avabahuka, Badhirya. In all above said conditions there is involvement of nervous component. But while explaining Chikitsa of Dhamani Gata Roga Siravyadha indicated, the mode of action of Samanya Vatavyadh Chikitsa in the form of Abhyanga, Sweda, Anuvasana Basti, Matrabasti etc results in increasing the vascularity there by leading to local blood supply and repair of tissues along with enhancing the function of nervous component.

**CONCLUSION:** Dhamani based on their characteristic feature is a structural media to carry Nutritional components. On the basis of literature review and discussion it is concluded that Dhamani is to be understood as artery. Though there is nervous involvement in the functions like speech, perception of sound, conduction of Rasadi Dhatu etc by propelling it forward the vascular supply is also equally important in maintaining blood supply and safeguard the integrity of each cellular component of the body and its function.

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**Corresponding Author:**
Dr. Swapna H N, PG Scholar, Sri Dharmanathala Manjunatheshwara Ayurveda Medical College and Hospital, Thanmiruhalla, Hassan, Karnataka.
Email: drswapnaayush9@gmail.com

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