TITLE: AUTONOMIC NERVOUS SYSTEM IN ANCIENT INDIAN SCIENCE: A VALUABLE EXPLANATION BY ANCIENT Ayurvedic and Yogic SCIENCE PIONEERS

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ABSTRACT:

Dating from the Vedic era the Ancient Indian science’s (Including the Ayurveda and Tantric Yoga Literatures) explanation makes substantial contribution to understanding the organization and functions of the Autonomic Nervous System, which closely correlates with the Modern Neurologists explained Autonomic Nervous System organization and function. In our present study we have gone throw the different Ancient Indian Science texts and after that selected the Literatures and Sanskrit Slokas which were Relevant to present day modern Autonomic neurology and then translated and explained it and after that compared it with modern Neurology, which reveals that Ancient Indian Science pioneers also have a deep accurate Knowledge about the Autonomic Nervous System.

Keywords: Ayurveda, Autonomic Nervous System, Sanskrit Slokas , Tantric Yoga.

INTRODUCTION

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In Ayurvedic classical literature, the anatomy of Autonomic Nervous System is described in different contexts at different places in gross manner. Accurate anatomy of the Autonomic Nervous System is not found in these classical textbooks. In some textbooks related to Tantric literature, a few anatomical details are explained. However, when it comes to physiology,
several important features and functions of Autonomic Nervous System have been explained with considerable precision. This article reviews the contemporary and ancient Ayurvedic literature related to the physiology of the Autonomic Nervous System.

Theory of ‘Tridosha’ forms the basis of Ayurvedic physiology, pathology and pharmacology. Though, the term ‘Dosha’ means ‘the disturbing factor’, it has got definite physiological importance in normal state. Basically three ‘Doshas’ – ‘Vata’, ‘Pitta’ and ‘Kapha’ – are responsible for maintenance of homeostasis in the body, and health is nothing but a state of equilibrium among these ‘Tridoshas’. Disease is manifested as a result of disturbance in the state of equilibrium among these ‘Doshas’. Among the three, Vata governs our activities and energies, which is responsible for initiating the all types of movements and acquiring, carrying the knowledge of different sense. ‘Pitta’ is responsible for the digestion, metabolism, production of heat and other form of energies, which gives our warmth and capacity to transform substances in the body. ‘Kapha’ performs the functions like protection, strength, stability and resistance. As Ayurveda is based on functional understanding of body, the different entities representing ‘Tridoshas’ at each level of organization can be assumed by analyzing these functions. In generalized terms, the nervous, endocrine and immune mechanisms can be equated to ‘Vata’, ‘Pitta’ and ‘Kapha’ respectively.[1]

Following are the important references from the textbooks that highlight the functions of Vayu, which in turn, are related to autonomic nervous system.

Vyana Vata makes the forceful ejection of Rasa Dhatu (possible from the heart). This ‘Rasa’ then circulates in the whole body continuously. According to Astanga Hridaya, the site of ‘Vyana Vata’ is Heart. A.H.Su.12.6

Sympathetic centre in the medulla oblongata, which is concerned with the control of heart, is vasomotor centre. Hypothalamus and other cortical areas in turn influence this. Similarly, nucleus ambiguous is the parasympathetic centre. Vyana Vata in this context is indicative of all these functional entities (Patwardhan K,2005).[1]

Vyana Vata, which moves all over the body, is responsible for the circulation of ‘Rasa’

The role of the nervous system in blood circulation cannot be neglected. Both cardiac output and peripheral resistance are under autonomic control. Sympathetic stimulation can produce peripheral vasoconstriction and thus can
produce an increase in peripheral resistance. Similarly, it can produce positive inotropic and positive chronotropic effects on heart, thus producing an increase in cardiac output. Parasympathetic stimulation, on the other hand produces a fall in cardiac output and thus a fall in mean arterial pressure (Patwardhan K, 2005).1

Active site of ‘Samana’ is adjacent to gastro intestinal tract. It performs the functions like reception of food, its digestion through the activation of ‘Agni’, its division into useful and waste parts and its onward propulsion.

All these functions are those of extrinsic autonomic nerves supplying the gut and those of enteric nervous system. submucosal plexus is concerned with secretion of enzymes whereas myenteric plexus controls the peristalsis (Patwardhan K, 2005).1

Pelvic region is the site where Apana Vata is active. Its functions are to bring about the activities like ejaculation, menstruation, defecation, micturition and parturition.

There is enough proof to say that all these activities are influenced in one or the other way by ANS (Patwardhan K, 2005).1

Autonomic Nervous system organization in Yoga/Tantra literature:
In the space outside the Meru, the right apart from the body placed on the left and right are two Nadis, Shashi and Mihira. Sira is also known as the Nadi. Mihir or surya Nadi is the Pingala, which is placed in right side. The Nadi Sushumna, where substance is the Trigunamahi”(having three properties), is in the middle she is the form of moon, sun and fire even water also; Her body, a string of blooming Dhatura flowers, extends from the middle of the Kanda to the head, and the Vajra inside her extends, shining, from the Medhra to the head. Sympathethetic nerve fibres, which are emerge from the both sides of the spinal cord, enter in their respective autonomic ganglia which are located on both sides like a chain. Ancient Ayurvedic and yogic pioneers named the right sided ganglion chain as the Pingala and left sided ganglion chain as the Ida. In the vertebral column the main Nadi which is situated like the creeper of piper retrofractum is called Sushumna.[2][3]

Muladhar chakra have a four dal, Svadhistana chakra have a six dal, the chakra which is situated in umbilicus is known as the Manipura chakra, which have a 10 dal, Anahata chakra have a 12 dal, which is located in heart, Vishudh chakra have a16 dal (plexus), which is located in throat, the chakra which is located in between the eyebrows is called the Agna chakra, which have a two dal. Beyond this there is a lotus shaped chakra exist, which goes in through the foramen
magnum (brahmarandhra) pathway and situated there is known as the Sahastra chakra, which have a 1000 dal (Goraksha Samhita).⁴⁴

Shatchakra’s explanation is found in different Yog-saadhna related books. Different plexus are formed in different places of our body by the specific meeting of the Ant-Lat sympathetic and parasympathetic fibres in Autonomic ganglia. Some of the Yog-saadhna related teachers termed the round structure which is formed by the meeting of the sympathetic nervous systems lateral fibre as a chakra. The meeting point of the Ida, Pingala and Sushumna along the merudanda is known as the Chakras. The chakras are also referred to as wheels, for they are the points from which many other Nadis radiates. When a chakra is open to the flow of Prana, then the characteristics of the chakra become manifests in the individual. Ida and Pingala may be taken to refer to parasympathetic and sympathetic nervous system respectively and the chakras to the known nerve plexi radiating from the spine. For the sake of simplicity one, associate the Nadis with nerves, the chakras with nerve plexi and Prana with nerve impulses.⁵

Starting from John Woodroffe all modern scholars has regarded the six centres as same mystical structures. There is confusion, too, about the centres. The scriptures state that the centres are in the Sushumna wrongly translated as the spinal cord. That is a wrong conclusion because Sushumna means the entire neural axis and not the anatomic Spinal cord. Artificial anatomical divisions like spinal cord are not acceptable in Yogic philosophy which has a functional approach, concerning itself only with the flow of nerve impulses, which is unobstructed throughout the neural axis.⁶

The six Chakras can be put into one-to-one correspondence with known anatomical neural plexi having origins at known levels along the spine and both sympathetic and parasympathetic Innervations. Each of this Plexus-Chakra is known to innervate one or more glands and/or visceral organs, just as explained by the ancient Yogis. They are as following.

1. Muladhara is the playground for Apana Vayu (Jnaneshvari Gita 6/200). The function of Apana Vayu is well known. They are excretion of urine, stool, semen, and foetus and sex act (Yoga Yagnavalkyam-4/67). The same functions are allotted to Muladhara. But according to modern neurology these are the reflex functions carried out through the Inferior Hypogastric Plexus. (B C Joshi, 1986).
2. The belly (Svadhisthana) Chakra anatomically has sympathetic innervations at the L1 level, and corresponds to the hypogastric plexus encompassing the pancreas, the intestine, and the Ovaries of woman.

3. Manipura Chakra regarded as the Solar Plexus, which is the seat of the fire within the body.

4. Anahata the heart chakra of the ancients can be thought to originate in the vicinity of T1, and to sympathetically innervate the heart, lungs, thymus gland and the lymph glands. Parasympathetic branches of the Vagus nerve originate at cranial nerve 10\textsuperscript{th}, 3.

5. Vishuddha is positioned at the neck region near the spine, with its superficial activation point in the pit of the throat. As regards the site of Muladhara chakra, it is clearly stated to be attached to sushumna, below the penis and above the anus, i.e. the midperineum. There is only one nerve structure present at this site, and that is the Inferior hypo gastric plexus with all its ramifications.

6. Ajna chakra matches with the right and left thalami of modern anatomy, because Ajna chakra consisting of two petals is sited at the highest levels in the central neural axis at tens figures breadth from the tip of nose. Ajna chakra receives afferent impulses from all five senses and the whole body. It is also the seat of desires, emotional feeling and sleep, all of which holds true for thalamus. Hence, physiologically Ajna chakra is once again identified as the thalami. Ajna chakra has a functionally subsidiary nerve station called ‘talu’ chakra situated at palate level which is depicted as the site of jivatma (Soul). This tallies with the vital functions of the reticular formation and the medullary nuclii, in the floor of the fourth ventricle, which structures are intimate communications and are truly responsible for maintenance of life.\textsuperscript{[5][6][7]}

CONCLUSION

In the present article we focused all aspects of the Autonomic Nervous system in respect to its organization and physiological explanations by varies ancient Indian Ayurvedic and Yogic science pioneers and correlate it with contemporary science, however the contemporary science historians today, fully ignore the Ancient Indian science pioneers valuable contribution in Autonomic nervous system because the
language used by the ancient Indian Ayurvedic Science pioneers for documentation of these early textbooks is in Sanskrit, a language that is not in day-to-day use among the general population but this article somehow reveals that Ancient Indian Ayurvedic Pioneers had clear and deep understanding of Autonomic Nervous system.

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