

Ancient Hindu Concept of Anatomy of Nervous System (An Analysis of Caraka)

Volume: 01

Issue: 01

January 1983

Page: 31-35

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Indigenous systems in medicine existed in India since thousands of years. Caraka represents the state of medicine two thousand years ago in India. An attempt has been made to analyse Caraka's treatise 'Caraka Samhita' to find out the state of knowledge regarding anatomy of nervous system then.

Material and Method

Caraka Samhita was reviewed for relevant data pertaining to nervous system. A glossary of even remotely possible equivalent words for brain and nerves was collected throughout the whole text. The meaning of each word thus chosen was analysed with reference to its context. Etymological significance of these words was also found out. With this, the state of knowledge regarding neuroanatomy was compiled.

Results

Head, Skull and Brain

Likely words, which could pertain to head, skull and brain were 'Sirah', 'murdha', 'lalatah', 'kapalah', 'mastiskam', 'manah', 'mustulungam' and 'hrdayam' (Table 1).

Table I - Various terms used in Caraka Samhita

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The word 'Sirah' has been used 147 times in the text. It has been used as an equivalent of head. At one place, its measurements have been given as 16 fingers high and 32 fingers in circumference [1]. It should be a hollow structure inside, since it can be filled with 'Kapha' [2]. No where is there a mention of any structure inside the 'Sirah'.

The word 'murdha' again connotes head in the general sense and has been used five times only.

The term 'lalatah' has been used ten times in the text. It means the forehead. The word 'kapalah' has been used only six times and connotes bony vault of the skull, as bony joints have been mentioned in it

[3].

The word 'mastiskam' has been used only thrice in the whole text. It has been used more or less synonymous to head. The reason for using this word so sparingly is not clear.

The term 'manah' has been used 91 times and invariably means the mind, that is abstract. It is interesting to find the terms 'mustulungam' used only once in the text. It probably means something, which is contained inside the head, since it has been stated that nasal medication might go inside if head is lowered too much and may get lodged in 'mustulungam' [4].

The term 'hrdayam' has been repeated 12 times in the text. This is a very difficult term to locate anatomically. 'Hrdayam' is two finger breadth in size [5]. It is a seat of consciousness [6]. It is also the centre of mind and insanity occurs if it gets injured [7]. It is a seat of epilepsy [8]. Bicardiac state has been described in the embryo [9]. It is one of the resorts of life [10]. From 'hrdayam' ten great vessels emanate [11]. At one place, 'hrdayam' and 'Sirah' have been used in a manner as to indicate that these are two separate organs [12]. There is evidence to suggest that 'hrdayam' is in the trunk [13]. All this goes to prove that 'hrdayam' is the heart of modern anatomy.

Etymologically, 'Sirah' is derived from 'Shrih' and would mean anything, which is connected to other organs. Even summit of a mountain is called a 'Sirah'. Head could be called 'Sirah' in the human body, since it is connected to the rest of the body.

The word 'murdha' is derived from 'murva' and connotes something which is close to each other. It could be used for head in general.

The word 'lalatom' has its origin from 'lalam', which means anything which imparts 'aishwarya', which in other words would hold true for the forehead.

The word 'Kapalam' is very interesting etymologically, since it is derived from 'Kam' which means water. 'Kapalam' could be used for something which contains water or something, resembling curd water, which would probably equate it with skull.

The word 'mastiskam' is derived from 'maskam', which means curd water. The word 'mastiskam' would mean something, which has the consistency of curd water and 'Sneha' or fatty substance. In the head, brain could be imagined of having such a consistency. 'Mustulingam' also conveys a similar connotation.

The word 'manah' means "we know". It includes all mental processes.

'Hrdayam' again is interesting etymologically. It has three different meanings. It is derived from 'harati', which means something, which is going out. It is also derived from 'hra' which would mean something which produces 'Buk-duk' sound. Its third meaning is derived from its origin from 'hriyate', which means something with which we are able to know everything.

Thus etymologically speaking, 'mastiskam' and 'Mustulingam' are the only two words, which could be equated to brain but that too could be done with a stretch of imagination.

The Nerve

The likely equivalents, chosen were 'srotah', 'dhamani', 'Sira' and 'nadi'. The word 'srotah' was used 86 times in the text. It has been used as a very general term, a source, from which something is emanating. It also denotes an opening, path or even place. It has been used interchangeably for 'dhamani', 'sira' 'rasavahini' and 'nadi' [14]. Most of these meanings accept it as a channel with a lumen.

The word 'sira' has been used thirty times. 'Sira' invariably is a channel with a lumen, through which something flows [15]. 'Sira' also contracts [16]. At several places, there is a mention of blood letting

through 'sira' i.e., venesection [17], [18], [19], [20]. There is a definite indication that these are superficially located [21]. 'Sira' has been described to form a network around umbilicus on the abdomen [22], [23], [24], [25], and temple [26]. This goes to prove that Caraka has used this term as an equivalent of vein most of the times, though at places, it has been used interchangeably as an artery. The very fact that a 'sira' has a lumen does not qualify it for a nerve.

The word 'dhamani' has been used seventeen times. This word has been used rather sparingly. It dilates [27], has a lumen which carried blood [28], and is red [29]. It pulsates [30]. By now it becomes clear that 'dhamani' is the artery of modern anatomy, though at places, it has been used interchangeably with 'sira'. Whether 'dhamani' is an artery or a vein may be debatable, but it cannot be a nerve. It might be of interest to realise that Caraka has used a specific word for a blood vessel as 'rakta vahini' [31], [32] only twice in the whole text, which is surprising.

The word 'nadi' has been used five times to denote channels from sweat glands [33], [34], [35], [36], [37]. It has been used twice for umbilical cord [38], [39]. At three places, its meaning is not clear, but it is definite that it is a channel with a lumen.

Etymologically, 'srotah' is derived from 'Srugalo' and would mean something which flows. The word 'sira' is derived from 'Si' and means a tubular vessel or lines, which cross each other like veins, 'Dhamani' is derived from 'dhamyate', which means a canal, which pulsates, which would clearly make it an equivalent of an artery. The word 'nadi' is derived from 'nadyati' and would stand for any tubular organ.

Discussion

Caraka Samhita represents the Hindu medicine as it stood 2000 years ago. The very fact, that the treatise is a product of an ancient conference of physician-sages it should be reflecting the state of knowledge in medicine at that time. The aim of the present study is to find out the state of knowledge in medicine at that time. The aim of the present study is to find out the state of knowledge regarding neuro-anatomy then. Most of the authorities consider 'vayu' in the body automatically have been interpreted as nerves. A vast body of knowledge has accumulated over the years with varying degree of claims of understanding of anatomy, as it is understood today.

While enumerating various 'Koshthas' [40], Caraka does not mention any anatomical equivalent of brain. The word 'Shira' has been called a 'koshthas', but nowhere has it been used as equivalent of brain. Caraka did know that head is one of the 'marmas' [41], [42], but beyond that, no importance has been attributed to 'hrdayam', which has been considered as the seat of life, intellect and consciousness. Even for perception of sensations, 'hrdayam' has been invoked [43]. Two possibilities might exist. The first possibility is that Caraka called the brain as 'hrdayam', but evidences do not point to such an assumption. Actually, from the available evidences, it would appear that 'hrdayam' is the heart of modern anatomy. The second possibility is that Caraka had no idea of brain as it is known to-day and thought that 'hrdaya' was the controller of intellect consciousness and thus in turn the whole nervous system. Nowhere in Caraka Samhita, is there a mention of 'manohridaya' as was later defined by Susruta. Like Galen, Caraka considered the heart to be the seat of consciousness. At one place, while discoursing, Kumarsira Bharadwaja holds the opinion that it is the 'Sirah' that is the seat of all senses [44], but, later in the debate, 'hrdayam', navel, rectum and hands and feet have been opined as the seat

of all senses. Finally, Dhanvantari, as if to seek a compromise, declares that it is the 'hrdayam' which is the seat of all senses.

It is apparent from the text, that mind-body concept [45], [46], [47] was very well developed but the chief coordinator for both was 'hrdayam'. The word 'hrdayam' etymologically would stand for heart of modern anatomy. Actually, looking at the paucity of terms, which could qualify for brain, it would appear safe to assume that the study of anatomy was not very well developed at that time and least so, that of the nervous system.

Despite all this, two terms need further discussion. What does 'mustulingam' mean? Its significance increases further by the fact that Caraka has used it only once in the whole text. This could qualify for something in the head i.e., the brain. But if the concept of brain was clear, why was this term not used more often? Etymologically, again, this word is quite interesting. It is derived from 'mustuivlinga' which means something that resembles curd water. Other word having a similar meaning is 'mastiskam' which again has been very sparingly used in the text. It is really baffling why 'mastiskam' has been used only thrice and 'mustulingam' only once in the whole text.

At one place, there is a term used as 'manoivahini' [48]. What did Caraka mean by this? Literally, it would mean channels of the mind, but since Caraka thought that 'hrdayam' was the seat of mind, probably, he has used this term to describe blood vessels from the heart itself, some of which, he thought, carried impulses of the mind.

There is an interesting observation, that 'Sirah' contains half anjali of tissue fluid i.e., 'rasa' [49]. It might be tempting to think that Caraka knew about cerebrospinal fluid, but then he further qualifies the statement that the quantity is as much as semen. Does it mean that Caraka inferred from occasional nasal discharges that 'Sirah' contained, some 'rasa' since in the light of modern knowledge quantity of cerebrospinal fluid cannot be equal to semen? But there is at least a farfetched resemblance between nasal discharge and semen, both in its consistency and quantity. If Caraka knew about cerebrospinal fluid, ventricles are too remarkable structures not to be commented upon by such a keen observer.

Now coming to the knowledge regarding nerves, none of the terms like 'Srotah', 'Sira', 'dhamani', and 'nadi' qualify for a nerve. All these are, beyond doubt, tubular structures with a lumen and so, could not be considered as equivalents of a nerve at all. At places, morbidity arising from these channels has been shown to give rise to diseases of nervous system e.g., at one place, Caraka goes to add that siras are channels, through which morbid humor is carried to the thighs and gives rise to uncontrollable tremors and weakness of movements [50]. It appears that it was his way of interpretation by connecting 'hrdayam' to every possible part of the body. Etymologically also, these words stand for tubular structures only.

Observations of Caraka on neurological diseases are very good, but since he considered 'hrdayam' to be the coordinator he linked it to explain most of these diseases.

Summarising Caraka's concept of nervous system, it appears safe to assume:

1. Caraka had no idea of 'brain' as it is understood to-day, though he had a clear understanding of mind-body concept.
2. Skull was never opened by the physician - sages, since it was considered a sanctum sanctorum.
3. Why they could not take a clue from skulls of animals, scarified for religious purposes is not very clear.
4. Since heart is a very prominent structure and has connections with the whole body, Caraka and his contemporaries called it as the chief coordinator of life, consciousness and intelligence. They

- believed that an injury to it could give rise to epilepsy and insanity.
5. It is surprising why no attempt has been made to describe the vessels arising from the heart in great detail, which could definitely be expected in such an exhaustive treatise. Whether it was because of any taboo on studying human anatomy in detail, is not very clear.
 6. They did describe three types of tubes 'sira', 'dhamani' and 'nadi' morphologically, but they never realised the functional difference and use these terms interchangeably.
 7. Nowhere does Caraka mention even the presence of a spinal cord as later defined as 'sushumna' by Susruta and yogic sciences.
 8. Caraka did have a very clear idea of clinical entities like migraine, paraplegia, hemiplegia, facial palsy but he was unaware its connection with the brain.

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