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SNĀYU(CONNECTIVE TISSUES) IN UP - TO - DATE ANATOMY – A CONCEPTUAL REVIEW

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ABSTRACT

The *Snāyu (Connective tissues)* is an anatomical structure whose major function is to withhold the entities like *Māṃsa* (Muscles), *Asthi* (Bones & Cartilages) & *Medas* (Adipose tissue), in order to give stability to the Human body in all possible ways. There are various opinions stated by many authors about the Anatomical consideration of the *Snāyu*, which seems to be not exact or not conclusive so as to consider it for clinical application. The concept of *Snāyu* as explained in Suśruta Saṃhita is very clear and can be applied clinically if understood in a proper way. This particular review is not just a critical one but there is an additional interest to carry out a research.

Key word: *Snāyu, Māṃsa, Asthi, Medas.*

INTRODUCTION: The term *Snāyu* as mentioned in the Sharira sthana of Suśruta Saṃhita is applicable for the anatomical structures like ligaments, tendons, muscles & veins. The word *Snāyu* means to bind; the string of a bow. It simulates the shape of *Shana(type of grass)* [1] (fibers of a herb). *Snāyu* is that which binds the structures and stabilizes the body. There are four kinds of *Snāyu* are present in human body at different locations carrying out different functions [2]. It is assumed that there are around nine hundred *Snāyu* present in the body [3]. The recent authors of Ayurveda literatures tried to correlate the Snāyu and its types with ligaments, tendons, fibrous bands and muscular strands, which is not justified with valid reasons and so not conclusive. There are many clinical conditions wherein the *Snāyu* is mainly involved in the pathogenesis of a disease for example the *Pakśāghata(Paralysis)* in which the *Vāta doṣa* does the *Viśośaṇa(atrophy)* of *Snāyu* and *Sirā,* So as to disable one half of the body. The similar concept of *Snāyu* in the current Anatomy is not clear and hence the structures responsible for causing such clinical condition is not understood.

CONCEPT PROPER:

The *Snāyu* is considered among the *Madhyama roga- marga* (the route of disease pathogenesis). The shape is said to be like *Shana*, and having the tensile strength just like the bow string. The *Snāyu* also has a lattice appearance at certain locations which are said as *Jala*. The *Snāyu* is considered to be one among the roots of *Medovaha srotas.* They bind the joints of the body along with other structures.

Phylogenetically the *Snāyu* is a condensed form of *Medas* (Adipose tissue) which is formed during the me- tabolism of *Medo dhatu.*These are vulnerable too, as told in the chapter of *Marma*. There are around twenty seven *Snāyu marmas* as mentioned in Suśruta Saṃhita [4]. These *Marma* are found to be consisting *Snāyu* as the predominant structure.By looking into above statements about *Snāyu* it is very clear that it is a physical entity which is having certain characteristic features as well as particular functions.

According to Suśruta Saṃhita there are four kinds of *Snāyu* has been identified based on their morphology and location. They are viz. *Pratānavati(Creeper like), Vrutta(Circular), Suṣira(Hollow inside)* & *Pruthu(Flat)*[2].

1. *Pratānavati*: This kind of *Snāyu* is spread like creepers and located in the Extremities and around the Joints.
2. *Vrutta*: The circular or cylindrical shaped, also known as *Kaṇdara*.
3. *Suṣira*: The *Snāyu* which is surrounding an opening of a tubular structure, and guards the opening. Three such locations are end of *Basti, Pakvāśaya* & *Āmāśaya.*
4. *Pruthu*: These are flattened structures which are seen on the back, head, flanks & front of thoracic region.

These four kinds of *Snāyu* has to be analyzed in terms of modern anatomy so that the relevance of these in clinical conditions affecting those locations can be understood and a treatment for the same can be planned properly.

DISCUSSION: The *Pratānavati(Creeper like)* type of *Snāyu* are those present around the joints of the extremities and giving support and stability to the joint [5]. There are many structure involved in carrying out this particular function, among those the Ligaments, Fasciae and the Tendons of few muscles can be considered.

For example: In the upper extremity the palmar fascia is a three-dimensional ligamentous system composed of longitudinal, transverse and vertical fibers.

The longitudinal fibers represent the phylogenetically degenerated metacarpophalangeal joint flexor.

The transverse fiber system consists of the natatory ligament (also known as superficial transverse metacarpal ligament), the transverse fibers of the palmar aponeurosis (also known as fibers of Skoog), and the transverse metacarpal ligament (also known as the deep transverse metacarpal ligament).

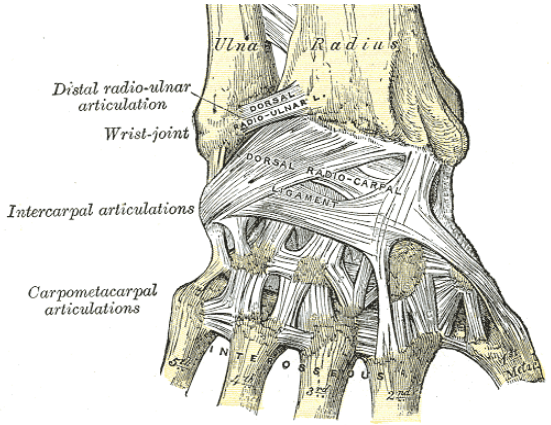


Fig. 1 Ligaments of Wrist Joint. (Grey's Anatomy

The vertical fibers are more delicate, and pass from the dermis, between the longitudinal and transverse fibers, to the fibrous flexor sheaths and the metacarpal bones.The Long Flexor Tendon Apparatus consisting the Flexor tendon sheaths and Extensor Tendon Apparatus[6] of the upper extremity appear like a *Pratānavati Snāyu(Creeper like).*

Fig. 2. The Long Flexor Tendon Apparatus

The *Vrutta(Circular)* kind of *Snāyu* are nothing but the structures which have a chord like appearance and support the joints and muscles of the body. A tendon is composed of dense fibrous connective tissue made up primarily of collagenous fibers. Primary collagen fibers, which consist of bunches of collagen fibrils, are the basic units of a tendon. Primary fibers are bunched together into primary fiber bundles (subfascial), groups of which form secondary fiber bundles (fascicles). Multiple secondary fiber bundles form tertiary fiber bundles, groups of which in turn form the tendon unit. Primary, secondary, and tertiary bundles are surrounded by a sheath of connective tissue known as endotenon, which facilitates the gliding of bundles against one another during tendon movement. Endotenon is contiguous with epitenon, the fine layer of connective tissue that sheaths the tendon unit. Lying outside the epitenon and contiguous with it is a loose elastic connective tissue layer known as paratenon (Fig 3), which allows the tendon to move against neighboring tissues. The tendon is attached to the bone by collagenous fibers (Sharpe fibers) that continue into the matrix of the bone [7].

The *Suṣira Snāyu* is the specialized muscular strand surrounding the terminal openings of particular organs. The three such locations are mentioned in Suśruta Saṃhita can be considered as -

1) End of *Āmāśaya* – Distal opening of Stomach, nothing but the Pylorus of Stomach.

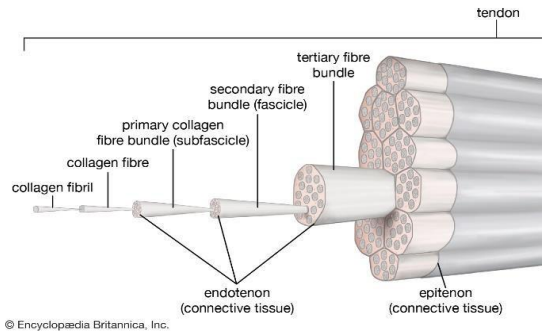
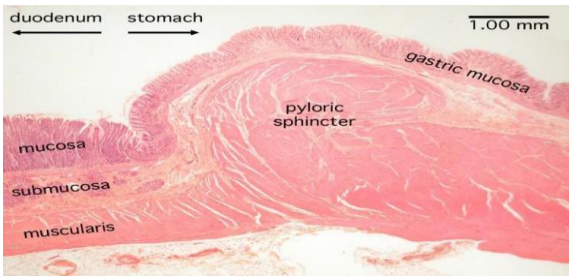


Fig. 3 – The fascicle and fiber arrangement in a tendon

The pyloric orifice is the opening into the duodenum. The circular pyloric constriction on the surface of the stomach usually indicates the location of the pyloric sphincter and is often marked by a prepyloric vein crossing the anterior surface vertically downwards. The pyloric orifice typically lies 1-2 cm to the right of the midline in the transpyloric plane with the body supine and the stomach empty. The pyloric sphincter is a muscular ring formed by a marked thickening of the circular gastric muscle interlaced with some longitudinal fibers (Fig. 4) [8].

Fig. 4 – Histology of Pylorus of Stomach



(Courtesy:http://faculty.cord.edu/todt/336/lab/digestion/PartB/duodenum/sphincter2.htm)

2) Terminal part of *Pakvāśaya* – seems to be more relevant with the evidence of muscular strand being present in the ileocaecal valve. A localized muscle thickening at the base of the ileal papilla is consistent with an intrinsic anatomical sphincter. There was no evidence that the ileocaecal junction has increased submucosal vascularity or a greater density of innervation compared to the adjacent bowel. The term ileocaecal valve is misleading and should be replaced by ileocaecal junction [9].

3) f *Basti* – It is very clear that these *Snāyu* can be compared with the urethral sphincters. Two sphincters surround the urethra. The sphincter vesicae (Internal sphincter) composed of non-striated muscle, and sphincter urethrae (external sphincter) composed of striated muscles. Both control outflow from the bladder. The internal sphincter vesicae controls the neck of the bladder and the prostatic urethra above the opening of ejaculatory ducts. The external sphincter or sphincter urethrae surrounds the membranous part of urethra as for as the inferior fascia of the urogenital diaphragm [10].

The *Pruthu* / *Pruthula Snāyu* meaning the widespread flattened structures located in the back, head, flanks & front of thoracic region. The word meaning of *Pruthu* being broad, wide, expansive, extensive, spacious etc. The aponeurosis present in the back is the Lumbar aponeurosis and the aponeurosis of trapezius muscles. In the chest region it's the aponeurosis of the abdominal muscles reaching up to the Costal margins and the lower true ribs.

In the head it's the aponeurotic layer of scalp connecting between the occipito frontalis muscle. Occipitofrontalis covers the dome of the skull from the highest nuchal lines to the eyebrows. It is a broad, musculofibrous layer consisting of four thin, muscular quadrilateral parts, two occipital and two frontal, connected by the epicranial aponeurosis. Each occipital part (occipitalis) arises by tendinous fibers from the lateral two-thirds of the highest nuchal line of the occipital bone and the adjacent region of the mastoid part of the temporal bone, and extends forwards to

join the aponeurosis [11].

Fig. 5 – The aponeuroses seen in the front of thorax and abdomen

CONCLUSION: *Snāyu* can be anatomically understood as all those structures in the specified locations which helps to connect between muscles to bones and muscles to Adipose & loose areolar tissues. Even though there are many opinions among the various authors of Ayurveda literature in recent past, the conclusive understanding was missing. In order to conclude affirmatively the critical analysis of the four types of *Snāyu* was essential. The favorable depiction for *Pratānavati Snāyu* would be those tendons in the extremities having branched out appearance. The *Vrutta Snāyus* are those tendons which are bigger in size and have cord like appearance or even a large nerve at certain locations. The *Suṣira Snāyus* will be the microscopic muscular strands of smooth muscles at the end of Stomach (Pylorus) and at the ileocecal junction and the External Urethral Sphincter and Internal Urethral Sphincter around the urethra. The *Pruthu/Pruthula Snāyu* are the flat and widespread aponeurosis present in the trunk region and in the five layered scalp. This will be a gross understanding of the *Snāyus* of Suśruta Saṃhita, the histological understanding may give much deeper justification to the concepts in application to clinical practice.

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