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STRUCTURAL AND FUNCTIONAL ASPECTS OF URDHAVSHAKHAGAT JAAL

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ABSTRACT :

Introduction- The *Sharir Sthan* of *samhitas* thoroughly studies the human body in *Ayurveda*. *Sushrut Sharir Sthan* provides the most thorough anatomical descriptions of them all. *Sharirsankhya Vyakaran*, the fifth chapter, defines a number of anatomical structures, including those found in *Paribhasha Sharir*. *Jaal*, a network comprising *Mansa, Sira, Snayu*, and *Asthi* that form interconnected plexuses, is one example of such a critical structure. These *Jaal* structures, which offer stability and movement, are mostly found at the *Gulfa* (ankle) and *Manibandh* (wrist) joints. Modern anatomical components such as muscles, ligaments, retinaculam
and bones are closely aligned with the *Ayurvedic* concept of *Jaal*. Material & Methodes- *Ayurvedic* books , and Sanskrit dictionaries, and current anatomical sources.Discussion -We can correlate *Ayurvedic* ideas via the prism of contemporary anatomy. Digital muscle tendons are correlated by *Mansa Jaal*, the palmar and plantar arterial arches by *Sira Jaal*, the retinaculum and intrinsic and extrinsic ligaments by *Snayu Jaal*, and the carpal and tarsal bone junctures by *Asthi Jaal*. Similar to the retinaculum in contemporary anatomy, which form tunnels to guide tendons and ligaments, the *Gavaksita* (window-like) arrangement of *Jaal* structures also adds to this stability.

Key words-*Jaal* , *Manibandh* ,Intrinsic ligamaent,Extrinsic ligament,Retinaculm

INTRODUCTION-

The body is called *Shariri* in *Ayurveda*. *Sharir Sthan* is a good resource for learning about human anatomy from an *Ayurvedic* standpoint. *Sushrut Sharir Sthan* provides more thorough anatomical explanations than any other *Samhita*. *Sharir Sushrut Shrestha*, as said. [1] A Each organ and *Pratyang* is explained in the fifth chapter of the *Sharir Sthan*, *Sharirsankhya Vyakaran*. Another *shariravavya* is also describe in this chapter. [2]Along with other *Ayurvedic* words, this chapter contains a thorough anatomy known as *Paribhasha Sharir*. The fifth chapter of *Sushrut Sharir Sthan* provides a thorough explanation of the *Jaal*, highlighting the network of *Mansa, Sira, Snayu*, and *Asthi* that unites the entire structure. The structures can be found at the lower limb's *Gulf Sandhi* and the upper limb's *Manibandh Sandhi*.[3]Each structure is made up of four parts known as Jaal: *Mans, Sira, Snayu*, and *Asthi*.Jaal are 16 in number. [4] *Jaal* is a far more powerful and stable structure both functionally and structurally. The same structures—muscle, palmer and planter aponeurosis,extrinsic and intrinsic ligament retinaculum, carpel, and tarsal bones—are found in both limbs, forming the network known as *Jaal*, when compared to modern anatomy. This makes it easy to identify the *Jaal* language of the *Paribhasha Sharir*.

MATERIAL & METHODES-

This study examines previous research articles using references to contemporary anatomy, historical *Ayurvedic* sources, *Rachana Sharir* texts, *Parishadya Shabdartha Shariram*, and *Sanskrit* dictionaries.

AIM AND OBJECTIVES :

Compile and record the traditional *Ayurvedic* texts about *Urdhavshakhagata Jaal*, keeping its teachings and insights intact.
Examine the anatomical characteristics associated with *Urdhavsakhagata Jaal* in detail and interpret them using the principles of modern medical science.

LITERATURE REVIEW :

AYURVEDIC LITERATURE OF JAAL

In *Sharir Sthana, Acharya Sushruta* outlined a number of anatomical structures, including *Sira, Snayu, Asthisanghat, Dhamani, Jaal, Kurcha,* and *Peshi,* as well as how to prepare dead bodies for dissection and how to do it. One of the most significant buildings in *Rachana Sharir* is *Jaal* .[5] According to a thorough explanation of *Jaal* given by *Acharya Sushruta,* the human body contains sixteen *Jaal*. *Acharya Charak,* on the other hand, made no mention of *Jaal* at all, while *Acharya Vagbhat* just stated the number without providing any additional context.
[6] The network of *Mansa* (muscles), *Sira* (vessels), *Snayu* (ligaments), and *Asthi* (bones) is referred to as *Jaal.* In certain places, these networks exist independently, but in others, such as the ankle *(Gulpha*) and wrist (*Manibandha),* they are woven together to produce a pattern resembling a window (*Gavaksita*). The buildings' strength and stability are strengthened by the interconnecting gaps created by this unusual configuration.
The wrist and ankle joints are extremely stable due to the close interconnectedness of these structures, which inhibits dislocation and separation. Different joint movements are made possible by the combined activity of these components, which is facilitated by this interwoven network. The *Sharangdhar Samhita* offers a comparable description of *Jaal*.[7]

LITERATURE OF WRIST JOINT

It is primarily formed by the articulation of the radius with the carpal bones of the hand. The structure that surrounds the wrist joint is

1. Digital muscle tendons
2. Palmer blood vessel arches
3. 3.Retinaculum
4. 4.extrinsic and intrinsic ligaments
5. 5.The carpel bone's junction

1. Digital muscle tendons [8]

Extensor tendon group

- Tendon of Extensor carpi ulnaris
- Tendon of Extensor digiti minimi
- Tendon of Extensor digitorum
- Tendon of Extensor indicis
- Tendon of Extensor pollicis longus
- Tendon of Extensor carpi radialis brevis
- Tendon of Abductor pollicis longus

Flexor tendon group

- Flexor pollicis longus tendon
- Flexor digitorum superficialis – Four tendon
- Flexor digitorum profundus- Four tendon
- Flexor carpi ulnaris tendon

2. Palmer blood vessel arches

The arch is formed by the anastomosis of the radial and ulnar arteries. The ulnar artery branches out to form the superficial palmar arch beyond the flexor retinaculum, giving the medial three and a half fingers three common digital branches and one suitable digital branch. The deep palmar branches of the ulnar artery complete the deep palmar arch medially at the base of the fifth metacarpal bone, with the terminal branches serving as the primary component. **[9]**

3. Retinaculum

Extensor retinaculum

The extensor tendons are held in place at the dorsum of the wrist by the fibrous, thickened band called the extensor retinaculum. **[10]** Attachments : Medially- Styloid process of ulna,Triquetral,Pisiform Laterally- Lower part of the anterior border of the radius. [11]
An oblique band that goes downward and medially prevents bowstringing. [12] At the lower end of the radius, it descends a septum that connects to the posterior surface of the longitudinal ridge. [13]. For individual tendons or groups of tendons and their sheaths, the retinaculum develops a septum that separates the deep space to the retinaculum into several tunnels or compartments from lateral to the medial side and each compartment is lined by a synovial sheath over the dorsal wrist[14].

Compartment

1. Abductor pollicis longus ,Extensor pollicis brevis
2. Extensor carpi radialis longus, Extensor carpi radialis brevis
3. Extensor pollicis longus
4. Extensor digitorum,Extensor indicis,Posterior interosseous nerve,Anterior interosseous artery

5. Extensor digiti minimi
6. Extensor carpi ulnaris

Flexor retinaculum

The flexor tendons of the fingers, thumbs, and flexor carpi radialis travel through the carpel tunnel, which is created by the dense fibrous band called the flexor retinaculum that crosses the anterior concavity of the carpus. *Jaal's* characteristics explicitly suggest that these retinaculum develop structures like windows or tunnels because they both demonstrate the same capacity to construct tunnels. The *Snayu* network may be connected to this building.

4. Extrinsic and intrinsic ligaments [15]

Extrinsic ligaments (connect to structures other than the carpus)

Volar

Dorsal

Collateral ligament of radius and ulna

Volar	Dorsal
Volar radio-ulnar ligament	Dorsal radio-ulnar ligament
Ulno-capitate ligament	Dorsal radio-carpal ligament
Ulno-triquetral ligament	Dorsal inter-carpal ligament
Ulno lunate ligament	
Volar radio triquetral ligament	
Radio-scapho-capitate ligament	

Intrinsic ligaments (purely attach to the carpal bones)

Mid carpal ligament
Scapho-trapeziot-rapezoid ligament
Scapho-capitate ligament
Triquetro-capitate ligament
Triquetro-hamate ligament

Since some of both intrinsic and extrinsic ligaments share the ability to form window-like structures, Jaal's characteristics specifically highlight that these ligaments create such formations. This structure also can be associated with the *Snayu* network.

5. The carpel bone's junction

The proximal and distal rows of carpel bones are numbered, totaling eight. The distal row contains the hamate, capitate, trapezium, and trapezoid bones. The proximal row of carpal bones extends from radial to ulnar and includes the scaphoid, lunate, triquetrum, and pisiform bones. It is similar to the network of *Asthi*. [16]

DISCUSSION :

A intriguing correlation analysis can be found in the study of human anatomy from both *Ayurvedic* and contemporary medical viewpoints. The *Paribhasha Sharir* of *Ayurveda*, especially the idea of Jaal as it is presented in *Sushrut Sharir Sthan*, offers a distinct structural understanding that is consistent with current anatomical understanding. The complex arrangement of anatomical systems in the body is illustrated by the identification of four types of *Jaal*: *Mansa Jaal* (muscular plexuses), *Sira Jaal* (vascular plexuses), *Snayu Jaal* (ligamentous plexuses, retinaculum cortex), and *Asthi Jaal* (bony plexuses).There are important parallels when we examine these *Ayurvedic* ideas from the perspective of contemporary anatomy. Digital muscle tendons are represented by *Mansa Jaal*, the palmar and plantar arterial arches by *Sira Jaal*, the retinaculum and intrinsic and extrinsic ligaments by *Snayu Jaal*, and the carpal and tarsal bone junctures by *Asthi Jaal*. The validity of historical anatomical knowledge and its applicability to contemporary medical science are highlighted by this fundamental approach.

The structural and functional significance of *Jaal* in joint stability is one of the study's main conclusions. The notion that these structures form a robust interwoven network that inhibits dislocation and improves mobility is supported by the presence of all four forms of Jaal in the *Manibandha* (wrist) and *Gulfa* (ankle). Similar to the retinaculum in contemporary anatomy, which form tunnels to guide tendons and ligaments, the *Gavaksita* (window-like) arrangement of *Jaal* structures also adds to this stability.The thorough literature assessment of the wrist joint also emphasizes how *Ayurvedic* and contemporary physical descriptions are identical. The structural elements of the wrist, including as the ligaments, carpal bone junctures, retinaculum, palmar arterial arch, and digital muscle tendons, closely match the *Ayurvedic Jaal* network. These results support the notion that, with the right interpretation, *Ayurvedic* nomenclature can be easily incorporated with contemporary anatomical terminology.

CONCLUSION :

we can correlate ancient anatomical knowledge by identifying the similarities between *Ayurvedic* classifications—*Mansa Jaal*, *Sira Jaal*, *Snayu Jaal*, and *Asthi Jaal*—and their modern equivalents. The following is a correlation between the *Jaal* at the wrist joint (*Manibandh*) and contemporary anatomical structures: Digital muscle tendons are represented by *Mansa Jaal*, blood vessel palmar arches by *Sira Jaal*, the retinaculum and extrinsic and intrinsic ligaments by *Snayu Jaal*, and the carpal bone juncture by *Asthi Jaal*.*Jaal's* crucial role in preserving joint stability, mobility, and structural integrity is shown by its presence in important joints including the wrist (*Manibandha*) and ankle (*Gulfa*). Similar to our current knowledge of ligaments, tendons, and vascular structures, the interwoven, window-like architecture of these networks improves strength and flexibility. Furthermore, improving musculoskeletal therapies like acupuncture, acupressure, and orthopedic interventions can be facilitated by acknowledging the functional significance of *Jaal.*

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