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A REVIEW ON MANIBANDH MARMA AS A RUJAKAR MARMA

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ABSTRACT

Marma Sharir is one of the prominent subject in *Ayurveda*. They are the important anatomical land marks which are the confluence of muscles, veins, ligaments, bones and joints. In these place *Prana* (life) resides especially by nature; hence when *Marma* are injured, they produce their respective effects. According to prognostic and structural classification *Manibandh Marma* is classified as *Rujakar* and *Sandhi Marma*. In present era of fast moving life when everyone is in hurry, painful condition of wrist joints becomes common complain. It is often caused by sprains, fractures, long term problems such as repetitive stress, and arthritis. To treat painful wrist successfully it is very necessary to find out its actual location, anatomical composition, and its vulnerable structures which is related to wrist pain. Physician and other health professionals use a person pain as a clue in figuring out what is wrong. Without proper understanding of the pain, it becomes very difficult to treat and manage the pain. This article is an attempt to define a proper guideline of exact location, composition and involvement of internal structures in painful condition of wrist joint. The study will enlighten the fact and factors which have answerable question why *Manibandh Marma* is called as *Rujakar Marma*.

KEYWORDS: *Manibandh Marma*, *Rujakar Marma*, wrist pain, range of motion of wrist.

KEYMESSAGE: *Manibandh Marma* is a *Rujakar* and *Sandhi Marma*. It contains various components such as distal end of Radius and Ulna, proximal row of Carpus, distal Radioulnar joint, Radiocarpal joint, Intercarpal joint, Midcarpal joint, various ligament, tendons and nerves situated here. These articulations are predominant in tendon, ligament and fibrous band as compared to other places. These structures are rich in nociceptors having high pain

threshold and silent in nature. In the presence of inflammation they become sensitize and convert in to low pain threshold receptors and produces more and more pain. This phenomenon explains the classification of *Manibandh Marma* as a *Rujakar Marma* on the basis of *Aghataj Parinama*.

INTRODUCTION

Ayurveda is the ancient system of medicine, which basically deals with principle of maintaining the health of a human being and preventing as well as curing the disease i.e. the main objective. In terms of this fundamental principle the primary goal of an *Ayurvedic* physician is to save *Prana.* The *Prana* is present in all over the body, but still its pedigree embedded in specific location of human composition; so basic structural knowledge of different structures of the human body is essential. Such a gathering of five fundamental human structures that is *Mamsa, Sira, Snayu, Asthi, and Sandhi* is one such distinctive location explained in classics where the energy or *Prana* is residing. These specific locations are explained as a concept of *Marma Sharir* in classics.

The detail of *Marma* is not only present in *Ayurvedic Samhita* but also present in *Veda, Upnishad, Iitihas* etc. *Acharya Susruta* has described *Marma Sharir* in a separate chapter because knowledge of *Marma* is said to be half knowledge of surgery. *Acharya Sushrut* has mentioned *Marma* on the basis of its importance to surgery by explaining all related aspects of it, viz. structural, regional, prognostic, metrical, numerical and *Mahabhut* predominance. *Marma* in *Ayurveda* can be taken as vital points in human body which when injured lead to instant death or death after some time. It can also produce *Vaikalyata* (deformity) or *Ruja* (pain) after *Abhighat*. *Acharya Sushruta* has mentioned that *Marma* should be carefully dealt during surgery and should always be protected from injury. *Manibandh Marma* out of the 107 *Marma* is described under *Rujakar* & *Sandhi Marma*. On the assumptions provided by various authors of the probable anatomical position of *Manibandh Marma* being an area situated over and around wrist joint. Functionally, trauma to *Manibandh Marma shows* restricted movement and lead to painful condition.

AIMS AND OBJECTIVE

1. To assess the appropriate position of *Manibandh Marma* and its structural anatomy.
2. To assess the vulnerable structure of *Manibandh Marma* which is related to *Ruja.*

MATERIAL AND METHOD

This study has been conducted in to two parts:

- **Conceptual study**- In this part classical literature, modern literature, books, thesis, journals articles, internet materials were reviewed and analyzed scientifically.
- **Cadaveric study**- This section of study had been carried out with the help of dissection on human embalmed cadaver which is available in the campus of Rishikul Ayurvedic college of Haridwar. Total six upper limbs had been dissected out to assess the structural anatomy of *Manibandh Marma*.

CONCEPTUAL STUDY

Etmyology Of *Marma*

e`&efuuthOkLFkkus]laf/kLFkkusrkRi¸ksZpAA

Ekkj¸kfURkbfreekZf.kAA¼**MYg.k½**

Parts of bodyin which injury causes death of human, these points are known *Marma*or vital points.

Definition of *Marma*

[1]eekZf.k ukeekalfljkLuk;ofLFklfU/klfUukr% rs"kqLoHkkor~ ,o fo'ks"ks.kçk.kkfLr'BfUrA

rLekUeeZLohHkgrkLrkarku~ HkkokukiFkUrsA

According to *Acharyas Marma* (fatal spots) are confluence of muscles, vein, ligaments, bones and joints; in these place *Prana* (life) resides specially by nature; hence when fatal spots are injured, they produce their respective effects.

Charak Samhita

According to *Acharya Charak* there are 107 *Marma*. In all that *Marma Acharya* give importance to only three *Marma*. These three *Marmas* are *Shir, Hridya* and *Basti*. In *Sharir Sthan Acharyas* give a description about ten *Pranayatan*. These are *Moordha, Kanth, Hridya, Nabhi, Guda, Vasti, Oja, Shukra, Shonit*. Out of these first six are *Marma* in view of *AcharyaSushrut.*

Sushrut Samhita

Acharya Sushrut clearly defines *Marma* a vital point which consist of aggregation of *Asthi, Sandhi, Snayu, Sira, and Mamsa*. *Sushrut* has classified *Marma* in the following way:

(1) Structural classification (*Rachana Bhed*)

(2) Regional classification(*Shadang Bhed*)

(3) Prognostic classification (*Sadhya Ashaydata*)

(4) Metrical classification(*Perivistar)*

(5) Composition wise (*Mahabhutik predominace)*

Structural	**Regional**	**Prognostic**	**Metrical**	**Composition wise**
Mansa Marma 11	Upper extremity 22	*Sadhypranhar Marma* (19) Fatal within 1-7	One finger size 12	*Sadhypranhar Marma Agni pradhan*
Sira Marma 41	Lower extremity 22	*KalantarpranharMarma* (33) 15 days to one month	Two finger size 08	*Kalantarpranhar Marma Agni+SomaPradhan*
Snayu Marma 27	Thorax and Abdomen 12	*Vishalyghana Marma* (03) May kill due to trauma	Three finger size 04	*Vishalyaghan Marma Vyaupradhan*
Asthi Marma 08	Back of Trunk 12	*Vaikalayakar Marma* (44) May kill due to trauma	*Swapanital* 29	*Vaikyalakar Marma Soma pradhan*
Sandhi Marma 20	Head and Neck 37	*Rujakar Marma* (08) No fatality considered.	Half finger size 56	*Rujakar Marma Agni and Vayupradhan*

Acharya Vaghbhatt has described *Marma* as total 107 at the body surface in 4th chapter of *Sharir Sthan in Astang Hridya* and by *Astang Samgrha* in 7th chapter of *Sharir Sthan*. There is a very minor difference from *Sushrut Samhita* regarding classification and measurements.

Rujakar Marma

Mahabhut predominance in *Rujakar Marma* are *Vayu* and *Agni* which lead to *Ruja* in associated part.

These are 8 in no. as described-

- xqYQkS)kSef.kcU/kkS)kS)s)s dwpZf'kjkafl p A :tkdjkf.ktkuh;kn'Vforkfucqf)eku~ AA ¼lq0'kk0 6@14½
- :tkdjk.;fXuok;qxq.kHkw;'Bkfu] fo'ks"krÜprkS:tkdjkS ¼lq0'kk0 6@[17]½
- :tkdjkf.keekZf.k {krkfufofo/kk :t% A dqoZUO;Urs p oSdY;a dqoS/kojkxks ;fn AA *¼lq0'kk0 6@41½*

Injury to Rujakar Marma give rise to many kinds of pain and if treated by a quack physician results in deformity of structure.

Etymology of *Manibandh Marma*

[2]ef.kcZ/;rs·= cU/k&pk/kkjs ?k¥~ izdks"Bik.;kseZ/;LFksA

In *Vachashpti Manibandh* has been defiened as the meeting point of *Prakoshth* and *Paani*. Here *Prakosth* is consider as distal 1/3 part of fore arm and*Paani* is defined as hand.[3] *Manibandha* has been defined in *Shabdakalpadruma* as the meeting point of *Prakoshta* and *Paani*.[4] *Dalhana* has mentioned that it is the *Moola* of Paani. [5]Monier Williams dictionary the term Mani has been meant as jewel, gem or a pearl and *Manibandha* as fastening or putting on wrist.

Terms related to *Manibandh*

[6]*Prakosth*- Distal 1/3 rd part of forearm.

Paani- Hand.

Marma	**Type of *Marma***	**Location of *Marma***	**Effect on Injury**	***Pramana***	**No. of *Marma***
Manibandh	*Sandhi*	*Shakha*	*Rujakara*	*Dwayangula*	*Dwisankhya*

RUJA

[7]*Ruja*:- In *Amarkosh* the term *Ruja* has been used inthe following ways- *Ruk,Rruja, Uptap, Roga, Vaydhi, Gada, Amaya and Saptarogamatha.*[8] Monier Williams explains the word *Ruja* as *Rujati* or to break, break open, destroy, to cause pain, injure, afflict etc.

PAIN

[9]**Defintion-** The standard definition of pain is that of the international association for the study of pain:

"An unpleasant sensory or emotional experience associated with actual or potential tissue damage is described in terms of such damage. Pain is always subjective. Each individual learns in the application of word through experiences related to injury in early life. Many people report pain in the absence of tissue damage or any other pathophysiological reason, usually this happens for psychological reason."

[10]Classification of pain

The perception of pain varies from person to person. That's because pain is mediated by nerve fiber in our body, and these nerve fiber have the property of sending pain signals to the

brain. Because every person body is different, their nerve fiber and their brain can react differently to the same stimuli. So that pain perception and pain tolerance can differ so much from one person to another person. It is measured in terms of pain threshold.

Pain Threshold- The point where a stimuli begin to produce a sensation i.e. pain, the lower limit of perception of a stimulus is called pain threshold.

There are several ways to categorize pain. One is

- Acute pain- Typically comes suddenly and has a limited period.
- Chronic pain- Last longer than acute pain and usually associated with long term illness.

Acute pain- Is a physiological response that warns us of danger. The process of nociception is the response to noxious stimuli that are potentially damaging to normal tissue. There are four basic process involved in nociception. These are;

- Transduction
- Transmission
- Perception
- Modulation

Transduction of pain

Transduction begins when the free nerve ending (nociceptors) of C fiber and A-delta fibers of primary afferent neurons respond to noxious stimuli. Nociceptors are exposed to noxious stimuli when tissue damage and inflammation occurs as a result of, trauma, surgery, inflammation, infection and ischemia or any other pathological condition.

Nociceptors- Is a sensory neuron that responds to damaging or potentially damaging stimuli by “sending possible threats signals” to the spinal cord and brain.

Location

- External- Are found in the tissue such skin, cornea, mucosa.
- Internal- Are found in a variety of organs, muscles, joints and the digestive tract.

The nociceptors have two different types of axons. The first are the A delta fiber axon which are large in diameter and myelinated, they are fast conducting. Second are the C fibers (Polymodal) which are unmyelinated and slow conducting.

Nociceptors are not uniformly sensitive. They are fall in to several categories, depending on their responses to mechanical, thermal, and or chemical stimulation liberated by the damage, tumor, and /or inflammation.

A noxious stimuli is an actually or potentially tissue damage event. It can be either

- Mechanical- Pressure, swelling, abscess, incision, tumor growth
- Chemical-Excitatory neurotransmitter, toxic substance, ischemia, infection.
- Temperature- Extreme heat and cold.

The cause of stimulation may be internal, such as pressure exerted by tumor or external, for example, a burn. This noxious stimulation causes a release of chemical mediators from the inflammatory cell including:

- Prostaglandin
- Bradykinin
- Serotonin
- Substance p
- Potassium
- Histamine

These chemical mediators activate/or sensitize the nociceptors to the noxious stimuli. This results in action potential and generation of a pain impulse.

Transmission of pain

The transmission process occurs in three stages

- From the site of transduction along the nociceptors fibers to the dorsal horn in the spinal cord.
- From the spinal cord to the brain stem;
- Through connections between the thalamus, cortex and higher levels of brain.

Ascending pathway of pain

A collection of nerve fibers that connects two masses of gray matter within the central nervous system is called a tract. Tracts may be ascending or descending. They are usually named after the masses of gray matter connected by them.

Lateral spinothalamic pathway is crucial for the pain pathway. The pain from peripheral receptor is transmitted to a first order neuron situated in the cell body of dorsal root ganglia.

The second order neuron situated in the posterior horn of the spinal cord which crosses the midline to ascend in the lateral spinothalamic tract to the thalamus where the third order neuron projects to cortical area (post central gyrus) of the cerebrum via the internal capsule.

Perception of pain

Perception of pain is the end result of the neuronal activity of pain transmission. When the painful stimuli are transmitted to the brain stem and thalamus, multiple cortical areas are activated and responses are elicited. These areas are;

The reticular system: Responsible for the autonomic and motor responses to pain and warning the individual to do something.

Somatosensory cortex: Involved with the perception and interpretation of sensation.

Limbic system: Responsible for the emotional and behavioral response to pain.

Modulation of pain

The modulation of pain involves changing in transmission of pain impulse in the spinal cord. The pathway involve in the modulation of pain are referred as descending modulatory pain pathways and these can lead to either an increase in the transmission of pain impulses or a decrease in transmission.

Chronic pain

Under normal conditions, deep structure such as joints and viscera are relatively insensitive to noxious stimuli. When intense, repeated, or prolonged stimuli are applied in the presence of damaged tissue or inflammation, the threshold for activating primary afferent nociceptor is lowered and the frequency of firing is higher for all stimuli. It contributes to tenderness, soreness and hyperalgesia. This phenomenon is called as sensitization.

Cadaveric dissection

[11]Dissection for anterior aspect of wrist joint

We have Mark the following points:

i. Centre of the suprasternal notch.
ii. Xiphoid process.
iii. 7’ o clock position at the margin of areola.
iv. Lateral end of clavicle.

- We have given an incision vertically down from the first point to the second which joins the center of suprasternal notch to the xiphoid process in the midsagittal plane.

- From the lower end of this line, extend the incision upward and laterally till we reach to the third point on the areola margin.
- Now we have to encircle areola and carry the incision upwards and laterally till the anterior axillary fold is reached.
- [12]We continue the line of incision downward along the medial border of the upper arm till its junction of upper one- third and lower two thirds. Make an incision in the middle of deep fascia of the upper arm right down to the elbow joint.
- We divide the deep fascia of the fore arm from the cubital fossa to the proximal margin of the flexor retinaculum. We make a transverse incision just proximal to the retinaculum and reflect the flaps of fascia to examine the anterior aspect of wrist joint.
- We will begin examine structures seen after removal of skin and superficial fascia. We see palmar aponeurosis which is triangular and made up of thickened deep fascia. Its apex, which is directed proximally, is continuous with the tendon of the Palmaris longus.
- Deep to the proximal part of aponeurosis we see the flexor retinaculum which is the band of deep fascia that keeps the flexor tendons in place. The ulnar nerve enters hand lying lateral to pisiform bone on the flexor retinaculum. The ulnar artery enters the hand lying just lateral to the ulnar artery. When we removed the flexor retinaculum and the palmar aponeurosis, we see the tendon of the flexor digitorum superficialis and profundus entering the hand and diverging to reach the medial four digits.
- We remove palmar aponeurosis and cut the flexor retinaculum between thenar and hypothenar eminences, carefully preserving the underlying median nerve and long flexor tendons. We identify the long flexor tendons in their synovial sheath and median nerve which enters the hand by passing deep to the flexor retinaculum.
- We have seen that in lower part of forearm the radial artery passes dorsally to enter the back of the hand. Palmar carpal arch was also identified here.
- We have given cut through the flexor and tendons and reflect them distally and define the capsular attachments and ligaments and relation of wrist joint. Fibrous capsule forms the margins of the distal ends of radius and ulna and from the margins of the articular disc to the proximal row of carpal bones, excluding the pisiform.
- [13]Divide the anterior, medial and lateral ligament by transverse incision across the front of the joint. Bend the hand backwards and expose the articular surfaces. This radiocarpal joint consists of the articulation between the convex proximal surface of the carpus and the concave socket formed by the distal surfaces of the radius and the triangular articular disc.

- To expose radio-ulnar joint we expose interosseous membrane by removing the muscles from the back or front of the forearm. We give cut through the annular ligament and divide the interosseous membrane from above downwards. We open the capsule of the distal radio- ulnar joint and draw the radius laterally to expose the connections of the articular capsule and disc.

[14]Dissection for posterior aspect of wrist

- Now we make the incision in center of dorsum of hand and reflect the skin of dorsum of hand till respective borders to examine posterior aspect of wrist joint.
- We examine the structure after removal of skin and superficial fascia. We have identified the dorsal carpal arch in the superficial fascia.
- We see deep fascia at the back of wrist thickened to form extensor retinaculum.
- We define its margins and attachments and identify the structures traversing its six compartments.
- Now we clear the deep fascia and define the attachments of the seven superficial muscles of the back of forearm. Now we separate the anterolateral muscles, i.e. brachioradialis, extensor carpi radialis longus and brevis from the extensor digitorum longus lying in the center and extensor digiti minimi and extensor carpi ulnaris situated on the medial aspect of wrist joint. We dissect all these muscle and identify deeply placed supinator muscle. Just distal to supinator is abductor pollicis longus. Other three muscle; extensor pollicis longus, extensor pollicis brevis and extensor indicis are present distal to abductor pollicis longus.
- We identify the posterior interosseous nerve at the distal border of exposed supinator muscle. We trace its branches to the various muscles. Posterior interosseous nerve traverse between the two planes of the supinator muscle and reaches the back of the forearm where it is already identified. The nerve goes through the muscles of the back of forearm, and ends at the level of the wrist in a pseudo ganglion.
- This nerve is accompanied by posterior interosseous artery distal to supinator muscle. This artery is supplemented by anterior interosseous artery in lower one-fourth of the forearm.

[15]Dissection for medial aspect of the wrist

A vertical incision made along the medial subcutaneous surface of ulna and along the medial borderof the hand. Now we observe extensor carpi ulnaris is inserted directly in to the base of

5th metacarpal and flexor carpi ulnaris is inserted directly through the medium of the pisiform bone and the pisometacarpal ligament to the base of 5th metacarpal.

Observation on ventral aspect

Skin	**Thick, immobile, creased**
Superficial fascia	Dense fibrous band which bind the skin to the deep fascia contain subcutaneous muscle palmar brevis
Deep fascia	Form flexor retinaculum at the wrist
Muscles	Superficial to flexor retinaculum- Palmaris longus Deep to flexor retinaculum- Four tendon of flexor digitorum superficialis Four tendon of flexor digitorum profundus Flexor pollicis longus Flexor carpi radialis Flexor carpi ulnaris Pronator quadrates
Blood vessel	Ulnar blood vessel superficial to flexor retinaculum. Anterior carpal arch deep to flexor retinaculum Radial artery deep to flexor retinaculum
Nerve	Superficial to flexor retinaculum Palmar cutaneous branch of median nerve Palmar cutaneous branch of ulnar nerve Ulnar nerve Deep to flexor retinaculum- Median nerve
Ligament	Fibrous capsule Palmar radio carpal ligament Palmar ulna carpal ligament Ulnar collateral ligament Radial collateral ligament

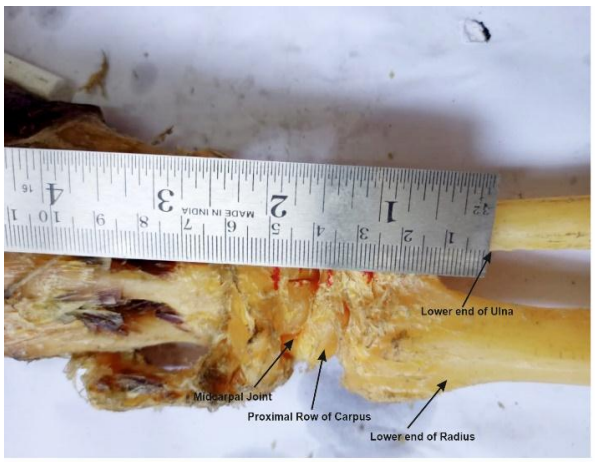
Observation on dorsal aspect

Skin	Loose on dorsum of hand in comparison to palmar surface
Superficial fascia	Contain dorsal venous plexus, cutaneous nerve that are superficial branch of radial nerve and dorsal carpal branch of ulnar nerve, dorsal carpal arch which is formed by dorsal carpal branches of radial and ulnar arteries.
Deep fascia	Thickened to form the extensor retinaculum, sends down septa which are attached to the longitudinal ridge on the posterior surface of lower end of radius. In this way 6 osseofascial compartments are formed on the back of wrist.
Muscles	Following muscles are noted in posterior side of forearm- Tendon of the extensor carpi ulnaris Tendon of the extensor digiti minimi Tendon of the extensor digitorum Tendon of the extensor carpi radialis longus Tendon of extensor carpi radialis brevis Tendon of extensor pollicis longus

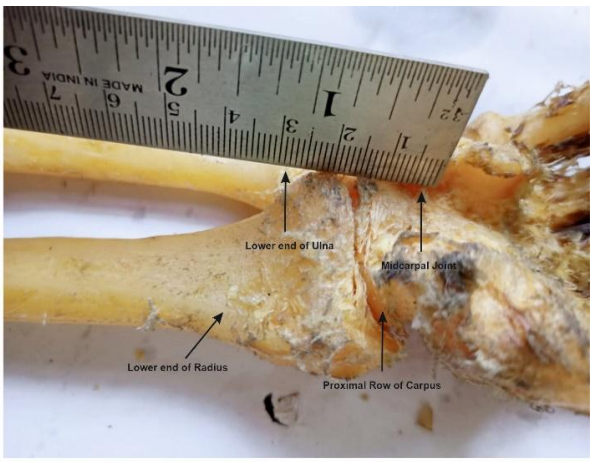
	Tendon of extensor pollicis brevis Tendon of abductor pollicis longus
Blood vessel	Posterior interosseous artery which is accompanied by anterior interosseous artery in lower 1/4th of forearm.
Nerve	Posterior interosseous nerve
Ligament	Fibrous capsule Dorsal carpal ligament Radial collateral ligament Ulnar collateral ligament

Observation on lateral aspect of wrist joint

Three long tendons of the thumb forming the boundary of anatomical snuff box. The anatomical box is a triangular depression on the lateral side of wrist. It is bounded anteriorly by tendon of the abductor pollicis longus, extensor pollicis brevis, and posteriorly by the tendon of the extensor pollicis longus. It is limited above by the styloid process of the radius. The floor of anatomical box is formed by the scaphoid and the trapezium. The radial artery crossing the floor of snuff box and disappearing between the two heads of the 1st dorsal interosseous. Superficial branch of radial nerve and cephalic vein is also seen here.



Dorsal aspect of *Manibandh Marma*



Venteral aspect of *Manibandh Marma*

Discussion to assess the appropriate position of *Manibandh Marma* and its structural anatomy

In *Ayurvedic* literature, *Acharyas* have considered the *Sandhi* as meeting place of *Asthi*. *Asthi* do the *dharana* karma of *shareera*. *Asthi* form *sandhi* with the help of *Snayu* and remain surrounded by *Sira* and *Mamsa* The meeting place of *Asthi*, *Mamsa*, *Sira*, *Snayu* and *Sandhi* is collectively considered as *Marma*. In all the *Marma*, *Manibandh Marma* are described under *Rujakar* and *Sandhi Marma* which is two in number.

Discussion on *Marma Viddha Lakshana*

Acharya Sushruta mentions the *Manibandha marma viddha lakshana* as *Kunthata.*

Kunthata

AcharyaSushruta mentions that *Manibandha marma* when gets injured will result in *Kunthata*.[16] In*vachaspatyamkuntha* is described as *Gatipratighat* that means restricted movement.[17] There are five type of movement which take place in the wrist joint. Those are flexion, extension, Radial deviation, Ulnar deviation and Circumduction. The range of flexion is greater at the radiocarpal, while in extension there is more movement at the midcarpal joint. Most adduction occurs at the Radiocarpal joint and abduction from neutral position occurs at the midcarpal joint. Circumduction of the hand consists of successive flexion, adduction, extension and abduction.

1. **Flexion- It takes place more at the wrist joint. The main flexors are**

i. Flexor carpi radialis
ii. Flexor carpi ulnaris
iii. Palmaris longus

The movement is assisted by long flexors of the fingers and thumb, and abductor pollicis longus.

2. **Extension: It takes place mainly at the midcarpal joint. The main extensors are**

i. Extensor carpi radialis longus.
ii. Extensor carpi radialis brevis.
iii. Extensor carpi ulnaris it is assisted by the extensors of the fingers and thumb.

3. **Abduction (radial deviation): It occurs mainly at the midcarpal joint. The main abductors are**

i. Flexor carpi radialis.
ii. Extensor carpi radialis brevis
iii. Extensor carpi radialis longus
iv. Abductor pollicis and extensor pollicis brevis

4. **Adduction (ulnar deviation): It occurs mainly at wrist joint. The main adductors are**

i. Flexor carpi ulnaris.
ii. Extensor carpi ulnaris.

5. **Circumduction:** The range of flexion is more than extension. Similarly, the range of adduction is greater than abduction (due to shorter styloid process of ulna).

Discussion on movement of wrist joint

- Flexion is carried out by flexor carpi radialis, flexor carpi ulnaris, palmarislongus and assisted by long flexor muscles. All these muscles except flexor carpi ulnaris is supplied by median nerve and flexor carpi ulnaris is supplied by ulnar nerve. So that 90% flexion is carried out by median nerve and 10% movement is carried out by ulnar nerve.
- Extension is carried out by extensor carpi radialis longus, extensor carpi radialis brevis and extensor carpi ulnaris and it is assisted by the extensor of the tendon. All these muscles are supplied by posterior interosseous nerve which is the branch of radial nerve. So that 100% extension movement is carried out by posterior interosseous nerve.
- Abduction is carried out by flexor carpi radialis, extensor carpi radialis brevis, extensor carpi radialis longus, abductor pollicis and extensor pollicis brevis. In all these muscles, flexor carpi radialis is supplied by median nerve and remaining muscles is supplied by posterior interosseous nerve.So that 35% abduction is carried out by median nerve and 75% movement is carried out by posterior interosseous nerve.
- Adduction is carried out by flexor carpi ulnaris and extensor carpi ulnaris which is supplied by median nerve and posterior interosseous nerve. So that 50% movement is carried out by median nerve and 50% movement is carried out by posterior interosseous nerve.
- From above discussion on movement of wrist joint, it become clear that most of movement of wrist joint is carried out by median nerve and posterior interosseous nerve.
- As per cadaveric dissection and modern literature, we find that posterior interosseous nerve pass over interosseous membrane, passes behind inferior radio ulnar joint and ends in the form of pseudo ganglion in the 4^{th} compartment of extensor retinaculum.
- Median nerve is located in the middle of forearm and reach down to wrist. Median nerve is located in front of the forearm in the middle position and posterior interosseous nerve is located in the middle of the back of fore arm. So that according to nerve location and *Manibandh Marma pramana* which is 2 *Angul, Manibandh Marma* can be considered as[18] 1*Angul(1.94)* above and 1*Angul(1.94)*below to the fibro cartilaginous disc.

The region of wrist joint which is the junction of *Hast* and *Prakosth* is circular in nature sot that whole of the circular area 1 *Angul* above and 1 *angul* below fibrocartilaginous disc can

be considered as *Manibandh Marma*. A fibrocartilaginous articular disc of the distal radioulnar joint binds the end of the ulna and radius together so it is the main uniting structure of the joint.

This circumference include inferior distal radioulnar joint, radiocarpal joint and intercarpal joint and midcarpal joint. These multiple articulation shows that *Manibandh Marma* is a *Sandhi marma* as described in *Ayurvedic Samhita*.

On the basis of above discussion and cadaveric dissection the five constituents of *Manibandh Marma* are as below-

***Asthi* (Bone)**

Lower end of radius, lower end of ulna, proximal row of carpus.

***Sandhi* (Joint)**

Distal radioulnar joint, radiocarpal joint, intercapal joint of proximal row, midcarpal Joint

***Mamsa* (muscles)**

On ventral side- Palmaris longus, flexor digitorum superficialis, flexor digitorum profundus, flexor pollicis longus, flexor carpi radialis, flexor carpi ulnaris, pronator quadrates.

On dorsal side-Extensor carpi ulnaris, extensor digiti minimi, extensor digitorum, extensor carpi radialis longus extensor carpi radialis brevis, extensor pollicis longus and abductor pollicis longus.

***Sira* (Vessels and Nerve)**

On ventral side-Ulnar blood vessel, anterior palmar carpal arch, palmar cutaneous branch of ulnar and median nerve, median nerve.

On dorsal side- Posterior dorsal carpal arch, radial artery,cephalic vein, posterior interosseous nerve, superficial branch of radial nerve.

***Snayu* (Ligament)**

On ventral side- Flexor retinaculum, palmar radiocarpal ligament, palmar ulnocarpal ligament, ulnar collateral ligament, radial collateral ligament.

On dorsalside- Fibrous capsule, dorsal carpal ligament, radial collateral ligament, ulnar collateral ligament.

Sandhi(joint)- Distal radioulnar joint, Radiocarpal joint, Intercarpal joint and Midcarpal joint.

Discussion on *Manibandh Marma* as a *Rujakar Marma*

[19]Inflammation is the body's immune system's response to an irritant. If inflammation is severe, it can causes general responses in the body in the form of exhaustion, fever and change in the blood, such as increased number of immune system cells. They release various substances, known as inflammatory mediators. These include the hormones bradykinin and histamine. These inflammatory mediators irritate nerves receptors and causes pain signals to brain. The inflammatory mediators which are released during this process activate the nociceptors which are present in the joint capsule and in deep somatic tissues to generate the impulse. The nociceptors which are present in the joint capsule and in the deep somatic tissue have the small-diameter myelinated A-delta and the unmyelinated C afferent fiber. These fibers are high threshold, polymodal, silent in nature and have slow conductivity. The pain produce by C fiber is diffuse, dull, burning and aching in nature which is referred as slow or second pain.[20] A large proportion of A-delta and C fiber are complete insensitive in normal noninjured, noninflamed tissue which is termed as silent fiber so these fiber have high pain threshold, however in the presence of inflammatory mediators, these afferent fiber become sensitive to mechanical stimuli.. Most nociceptors contain polypeptide mediators that are released from their peripheral terminals when they are activated. An example is substance P, which is a potent vasodilator, degranulated mast cell and a chemoattractant for leukocytes and increases the production and release of inflammatory mediators.

One possible explanation of the awaking (responsive) phenomena is that continuous stimulation from the damaged tissue reduces the threshold of the nociceptors and causes them to begin responded. These characteristic properties may explain how under pathological conditions the relatively insensitive deep structures can become the source of severe and debilitating pain and tenderness.

CONCLUSION

- *Manibandh Marma* is situated at the junction of hand and forearm. It consist of multiple articulation such as distal radioulnar joint, radiocarpal joint, intercapal joint and midcarpal joint, so it is appropriate to categorized *Manibandh Marma* under *Sandhi Marma* as described in *Samhita*.
- These articulations are predominant in tendon, ligament and fibrous band as compared to other places. These structures are rich in nociceptors which have high pain threshold and

silent in nature. In the presence of inflammation they become sensitize and convert in to low pain threshold receptors and produces more and more pain. This phenomenon explains the classification of *Manibandh Marma* as a *Rujakar Marma* on the basis of A*ghataj Parinama*. The vital parts which are related to *Rujakar Marma* are precisely of polymodal nociceptive pain receptors, being high threshold and silent in nature.

- Physician and other health professionals use a person pain as a clue in figuring out what is wrong. Without proper understanding of pain it becomes very difficult to treat and manage the pain. This article is an attempt to present a proper guideline how to *Manibandh Marma* work as a *Rujakar Marma.*

REFERENCES

1. *Sushruta Samhita, Sharir Sthan Partekmarmanirdesh Sharirm Adhaya* 6/16, *Ayurvedatattvadandipika Hindi* commentary by *Kaviraja Ambikadutta Shastri; Chaukhambha Sanskrit Sansthan Varanasi*, 2014; 69.
2. *Vachaspatyam (virhatsanskritabhidhanam) shritaranathtarkavachaspati* bhattacharya ed.6 part, 4714.
3. *Amarasimha Haragovinda Shastri,* editor *Amarkosha,*Varanashi: *Choukambha Sanskrit Sansthan,* 2006; 281.
4. *Sushruta Samhita* with *Nibandha Sangraha* of Dalhan *Acharya* 8th ed.*Varanasi: Chaukhambha* Orientalia, 2008; 824, 373.
5. Monier Williams.M., editor A Sanskrit to English Dictionary. Delhi:Motilal Bawarsidass, 2005; 1333, 775.
6. *Parishadhamshabdarthshariram, editor pt. Damodar Sharma gaur:shreevaidhyanath Ayurveda bhavan ltd,* 1979; 198, 22.
7. *Amarasimha. HaragovindaShastri*, editor. *Amarakosha*. *Varanasi: Choukambha Sanskrit Sansthan,* 2006; 667, 281.
8. Monier Williams.M., editor. A *Sanskrit* to English Dictionary. Delhi: *Motilal Bawarsidass,* 2005; 1333, 882.
9. www.iasp-pain.org.
10. https://www.nursingtimes.net/clinical-archive/pain-management/anatomy-and–physiology-of-pain.
11. Cunningham's manual of practical anatomy, volume 1 Fifteen edition, edited by, G.J. ROMANSE, Oxford university press, 2003; 22, 23.
12. Cunningham's manual of practical anatomy, volume 1 Fifteen edition, edited by, G.J.

ROMANSE, Oxford university press, 2003; 67, 74.

13. Cunningham's manual of practical anatomy, volume 1 Fifteen edition, edited by, G.J. ROMANSE, Oxford university press, 2003; 106: 108.
14. BD *Chaurasia's* HUMAN ANATOMY, 5th Edition, edited by *Krishna Garg*, 1: 134, 135.
15. GRANTS ATLAS OF ANATOMY, Ninth edition edited by john N. Gardner, printed by Williams & Wilkins, Baltimore, Maryland 21202, USA, 438.
16. *Vachashpatyam (virhatsanskritabhidhanam) shritaranathtarkavachaspati* bhattacharya ed.6 part, 2074.
17. Peter L.Williams & Roger Warwick; GRAY'S ANATOMY, 36th edition; Churchill Livingstone; Edinburg London Melbourne and New York, 1980; 874.
18. AFI (The Ayurvedic Formulary of India), part 1, second edition, Appendix-v, The Controller of Publication, 2003; 483.
19. https://www.ncbi.nlm.nih.gov/books/NBK279298/
20. Harrison's principles of internal medicine 15th edition, 1: 55, 56.