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STUDY OF MANIBANDHA MARMA AND ANATOMICAL CHANGES IN WRIST JOINT WITH SPECIAL REFERENCE TO ORTHOPEDIC TRAUMA

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ABSTRACT

For decades, *Marmavigyanam* has been an extremely important part of *Ayurveda*. The concept of *marmas* forms a part of *shareera*. Modern science hasn't realized the perception of *Marmas* yet, but the science of *Marmavigyanam* is an essential part mentioned in *Ayurvedic samhitas*. *Marmas* are the 107 vital points of the body, if injured can lead to fatal complications or even death. Every *marma* on *aghat* (injury), doesn't cause death but causes fatal effects to the injured persons. Various *acharyas* have mentioned different kinds of *marmas* depending on their position, constituents, *viddhalaxanas* (symptoms due to trauma), number, dimensions etc. depending on the aftereffect of injury to *Marmas. Mani bandha Marma* is one such *Marma* related to the upper limb i.e. hand, when any kind of injury is caused to *Mani bandh Marma*, there may be symptoms like *Ruja* (Pain), *Stabdhapadata* (restricted movement), *Khanjata* (Functional deformity). In this study, a sincere attempt has been made to study the *Mani bandha Marma* in detail along with anatomical changes in wrist joint due to orthopaedic trauma and to elaborate the concept of surrounding structures which will not only be helpful in the management of various surgical procedures involved but also prognosis in *marmaghat* (trauma)like conditions. It is an attempt to present proper guidelines for surgical and medical management of the Wrist joint.

Keywords: *Marma Injury,Manibandha Marma, Rujakar Marma, Orthopaedic Trauma, Anatomical changes*

INTRODUCTION

The scientific study of the subject *Rachana Sharir* (Human Anatomy) enters the earliest talk of *Marma* that is found in *Rig Veda* where *Indra* is set to have defeated *Vritra* by attacking his *Marma* with *vajra* in between shoulders. Description of *marmas* is also found in *Atharva Veda* with numerous scattered references in *Vedic* and epic sources. The concept of *Marmas* forms a part of *Shareera*. Modern science hasn't realized the perception of *Marmas* yet, but the science of *Marma vignyanam* is an essential part mentioned in *Ayurvedic samhitas* in *Sharirsthana* of various *Samhitas*. *Acharya Sushruta* and *Acharya Vagbhata* have mentioned various types of '*Marmas*' depending upon their position, constituents, *viddha lakshanas* (prognosis), number, dimensions etc. depending upon after-effect of injury to '*Marmas*'. *Manibandha Marma* is one of the delicate and vital points of the body located in the hands, especially in the wrist joints. *Manibandha sandhi.* is very important *marma* as it is situated in hand and injury to hand makes a man handicapped. Most of time during fall there is chances of fracture and *marmaghat* to this point. i.e., *Manibandha Marma.* So careful study of *Manibandha marma* with reference to trauma & its *abhighataj laxanas* need to be studied. As surgically it is very crucial to have deeper understanding of anatomical structures involved at wrist joint, the symptoms and anatomical changes taking place into it due to orthopaedic trauma.

Literature Review:

As per *Acharya Sushrut, Marmas* are the anatomical sites where five structures of the human body viz *Mamsa* (Muscles), *Sira* (Vessels), *Snayu* (Ligaments), *Asthi* (Bones), and *Sandhi* (Joints) meet together at one point. Some experts opine that it doesn't mean all the structures must be collectively present at that site. (1) *Dalhana*, the redactor of *Sushrut Samhita* has opined that *Marmas* are the vital parts of the body if injured results in death or fatal complications. *Narhari* the Author of *Raj Nighantu* defined *Marma* as the seat of life. *Acharya Charaka* has opined that it is the site of *Chetana*, hence the sensation of pain will be more in this region compared to other parts of the body. (2) *Ashtang Hridaykara* has defined *Marmas* as the sites which are painful on the application of pressure and shows abnormal pulsation. (3)

Bhavprakash has defined Marmas as the meeting place of *Mamsa, Sira, Snayu, Asthi* and *sandhi* where *prana* or life resides. There are 107 vital marmas present in our bodies. (4,5) *Prana* resides at these sites, so they are important. *Acharya Sushrutha* and *Acharya Vagbhat* have mentioned various types of Marmas depending on their position, constituents, *viddha lakshana*, number, dimension depending upon aftereffects of injury to *Marmas*.

***Mani Bandh Marma* (6)**

Mani bandha is described in *Shabda kalpa Druma* as the meeting point of the *prakoshtha* (bones of the forearm) and *paani* (hand). *Dalhana* has mentioned that it is the *moola of paani*. In Monier Williams dictionary, the term *mani* has been meant as jewel, gem or pearl and *Mani bandha* as fastening or putting on the wrist. It is located at the meeting point of *prapani* and *hasta*.

Mani bandha Marma is one of the delicate and vital points of the body located in the hand, especially in the wrist joint. *Manibandha Marma* is located at both the upper limbs and at the junction of the forearm. The structures involved in wrist joints are, radial ulnar, median nerve and arteries, Radioulnar and Radio-Carpal ligaments.

Classification (7)

Location: shakha (Extremity)
Number of Marma: *Dway*(two)
Type: Sandhi *(*According to Rachana)
Parimaan: Two Angul (Two Finger)
As per structure: *Snayu Marma*
As per Parinaam: *Rujakar Marma*
Underlying Structure: Wrist Joint

Modern Review:

Wrist Joint (Radio Carpal Joint) (8)

Type:

The wrist joint is a synovial joint of ellipsoid variety between the distal end of Radius and articular disc

overlying the distal end of the Ulna above and the scaphoid, Lunate and Triquetral bones below.it is the proximal segment of the hand and is biaxial.

Articular Surfaces: Upper: a) Inferior surface of the lower end of Radius, b) Articular disc of inferior Radioulnar Joint

Lower: a) Scaphoid, b) Lunate, c) Triquetral

Fibrous Capsule: The fibrous capsule is lined by a synovial membrane which is separate from that of Inferior Radio-ulnar and intercarpal joints.

Ligaments: The fibrous capsule is strengthened by:

a) Anterior (Palmar Radiocarpal) ligaments
b) Posterior (Dorsal Radiocarpal) ligaments.
c) Posterior (Dorsal Radiocarpal) ligaments
d) Medial ligament (Ulnar Collateral) Ligaments
e) Lateral collateral (radial Collateral) ligaments

Synovial Membrane:

This lines the capsule and is attached to the margins of articular surfaces. The joint cavity does not communicate with that of the Distal Radioulnar Joint or with the joint Cavities of intercarpal joints.

Blood Supply:

- Interosseous Artery
- Anterior and posterior carpal branches of the Radial and Ulnar, Palmar& Dorsal metacarpal and recurrent rami of the Deep Palmer Arch.

Nerve Supply:

- Anterior Interosseous branch of Median Nerve
- Deep branch of Radial Nerve (Posterior Interosseous branch)
- Dorsal and deep branches of Ulnar Nerve.

Wrist Joint Injuries: (9)

Fall on outstretched Hand

The fall on an outstretched hand can strain the anterior ligament of the wrist joint, producing synovial effusion, joint pain, and limitation of movement. Here the force is transmitted from the scaphoid to the Distal End of Radius, the Radius across the interosseous membrane to the ulna, from Ulna to Humour, through the glenoid fossa of the scapula to the Coracoclavicular ligament and the clavicle and finally to the sternum.

Colle's Fracture

This is a complete transverse fracture of the distal 2 cm of the Radius. The distal fragment is displaced dorsally and is often comminated; the fracture results from forced dorsiflexion of the hand in an attempt to ease a fall by outstretching the upper limb. Often the ulnar styloid process is avulsed, this condition is referred to as Dinner Fork deformity because a posterior angulation occurs in the forearm just proximal to the wrist and normal anterior curvature of the relaxed hand. The posterior bending is produced by posterior displacement and tilt of the distal fragment of the Radius. This fracture is most common in adults >50 years of age and most frequently occurs in women as their bones are weakened by osteoporosis.

Anterior Dislocation of Lunate:

It is an uncommon but serious injury resulting from a fall on the dorsiflexed wrist. The displaced Lunate may compress the median nerve and cause Carpal Tunnel Syndrome.

Sprain of Wrist:

Colle's fracture is often associated with avulsion of tip of ulnar styloid where the ulnar collateral ligament of the corpus is inserted,

Fracture of Scaphoid: Scaphoid is the most frequently fractured carpal bone. When a fracture occurs across the waist of the scaphoid, the proximal portion undergoes Avascular Necrosis and produces degenerative joint diseases of the wrist. It is common in young adults.

Fracture:

Separation of the distal Radial epiphysis is common in children because of the frequent falls in which the forces are transmitted from the hand to the Radius.

Carpal Tunnel Syndrome:

It is caused by pressure on the median nerve within the Carpal Tunnel. The nerve injury may be a direct effect of increased pressure on the median nerve caused by overuse, swelling of the tendons and cysts arising from the carpal joints.

The most common cause of this type of fracture is a fall on an outstretched hand. In many young adults, this fracture is caused due to result of a fall from a

significant height or a motor vehicle accident. The risk of injury is increased in patients with osteoporosis and other metabolic bone diseases. The patient usually presents with a history of an injury and localised pain with deformity and swelling restriction of movements. Numbness of the hand can occur because of compression on the median nerve across the wrist (Carpal Tunnel Syndrome). This deformity often limits the motion of the fingers.

Aim: To study the *Manibandha Marma* and its relationship with anatomical changes in the wrist joint with special reference to Orthopaedic Trauma.

Objectives:

1. To study the *Manibandha Marma* in terms of anatomical structures involved according to Rachana sharir and Modern Anatomy.
2. To study the changes in structural anatomy of wrist joint with special reference to Orthopaedic Trauma.

Materials and Method

Study Design: A Retrospective Cross-Sectional Study

Size: Total 50 reports of patients who were taken for the study

Material and Method

Conceptual study: All the literature about *Marma Sharir* and *Manibandha Marma* along with an anatomy wrist joint was collected from *Brihatrayees, Laghutrayis* and other related *Ayurvedic* and modern books including the journals and articles etc.

Method of Actual Observational Study

a. Dissection

To obtain the knowledge of anatomical structure at *Manibandha Marma* and *Sandhi*, Cadaveric dissection was performed in the dissection hall of the Department of *Shareera Rachana*. While studying the dissected cadavers, photo images have been taken with the help of a digital camera for record and the study of *Manibandha marma*, its surrounding structures and applied aspects with orthopaedic trauma.

Research Tool

For cadaveric dissection study

- Cadaver
- Dissection kit

Sampling Plan

Criteria of selection of cadaver

Inclusion Criteria

1. Cadaver with fully developed body parts.
2. The cadaver of either sex, having national death.
3. Cadavers are preserved by the appropriate method of preservation.

Exclusion Criteria

Death due to poisoning or any chronic illness.

Procedure

Dissection was done on cadavers by using a dissection kit at the place of Mani bandha sandhi; as described in Cunningham's Manual of Practical Anatomy and B.D. Chourasia's Human Anatomy for understanding the structures related to Wrist Joint, Radius, Ulna and nerves passing through it.

a. Dissection:

To obtain the knowledge of anatomical structures at the position of *Manibandha marma* and *sandhi*, cadaveric dissections were performed. While studying the dissected cadavers, photo images were taken with the help of a digital camera.

At the wrist, identified the following structures:

a. Radio-Carpal Joint
b. Ulnar Collateral ligaments
c. Radial Collateral ligaments

At the intercarpal or Midcarpal Joint-

a. Palmar Radiocarpal Ligaments
b. Palmar Ulnocarpal Ligaments
c. Radio Carpal Ligaments

At the Carpo-metacarpal Joints:

Palmar Metacarpal Ligaments

At the Metacarpophalangeal Joint:

a. Groove for the Flexor Tendons
b. Deep Transverse Palmar ligaments
c. Metacarpo-Phalangeal Joint of the thumb

At the Inter-phalangeal Joints:

a. Proximal Interphalangeal Joint Capsule
b. Distal Interphalangeal Joint Capsule
c. Collateral Ligament

Dissection Photographs:

Sampling plan for patients:

To evaluate the co-relation of *Manibandha Marma* along with anatomical changes in Wrist Joint due to orthopaedic trauma, the report (CRF) along with radiological investigation like X-ray and CT scan (if available) cases were taken from Shalya OPD of *Ayurvedic* College and Hospital.

The report and investigation case records were selected from the period Jan 2016 to December 2016 who had reported to the OPD of Shalya.

Inclusion criteria for a report of patients:

1. Patients who had an age between 20 to 70 years irrespective of sex religion and socio-economic status.
2. Patients who had suffered from Orthopaedic Trauma to hand.
3. Fracture of lower end of Radius, Ulna or Wrist Joints.
4. Dislocation of Wrist Joint.

Exclusion Criteria:

1. Patients suffered from chronic illnesses like TB, Malaria, Typhoid Meningitis etc.
2. Had multiple fractures of the upper limb or lower limb.
3. Patients suffered from a head injury and /or medico-legal cases.

Sample Size

In this study, a report of subjects was taken for the period of the last 1 year who had reported to the *Shalya* OPD and suffered from orthopaedic trauma.

b. Radiological Investigations:

Radiological findings were collected from registered cases of *Mani bandha Marmaghat* or Orthopaedic Trauma to hand or resulted in the fracture of Wrist Joint from *Shalya* department of the hospital.

Xray:

The detailed observations of Xray were done and concluded the results.

CT Scan (if available)

CT Scan report findings were considered if it was done for the patients.

Assessment Criteria:

Observations

Observations were recorded for the following points:

1) Observations were obtained from the literature study of *Manibandha marma* according to the *Ayurvedic* view.
2) Anatomical structures were seen at the site of *Manibandha marma* and *Manibandha Sandhi* (Wrist Joint) from the cadaveric dissection.
3) Radiological findings of CT scan Xray noted about the structure of wrist Joint.
4) Co-relator observations were made as per *Ayurveda* and Modern Anatomy regarding *Aghata lakshanas* (symptoms due to trauma) of *Manibandha marma* and orthopaedic trauma to the lower end of Radius.

Observations and Results

It is a Retrospective Cross-sectional study, conducted with the help of 50 X-ray reports of the patients. These Radiological findings were collected from

known patients of Wrist fracture of *Manibandha Marmabhigata* from OPD, IPD of *Shalya* Department of the hospital.

Basic data were collected from the X-ray reports of 50patients who had an age between 20-60 years irrespective of sex, religion and socioeconomic status from *the shalya* department of the hospital. The detailed observation was obtained from X-rays, CT Scan reports.

Results:

In this study, a total of 30 (60%) X-ray reports were observed from female patients. The greater number of females was recruited in the study group may be due to the random selection of patients.

Following findings have been obtained in this study:

As per the Inclusion Criteria of the report of X-ray examined of 50 patients. Reports of patients having ages between 20-70 years were taken and distributed in five age groups.

Table 1: Showing distribution of patients in different study groups

Age (Years)	**Study Group**	
	n	**%**
20-30	9	18
31-40	9	18
41-50	10	20
51-60	22	44
61-70	0	0
	50	**100%**

- Out of 50 patients, in this study, a maximum number of patients were of Hindu religion, they were 40(80%),7 (14%) was from Buddha religion,2 (4%) was of Sikh religion followed by single patients (2%) from Muslim religion, maybe due to population distribution.
- Education status shows that, out of 50 patients,41(82%) was literate while 9 (18%) were Illiterate.
- Out of 50 patients,42 (84%) was married while 8 (16%) were unmarried.
- 15 (30%) patients were observed from a higher class, 35 (70%) found from the middle class.
- Out of 50 Patients, 29 (58%) were vegetarian while 21 (42%) were non-Vegetarian.
- 29(58%) were Vegetarian while 21 (42%) were Non-vegetarian.

b. Radiological Observation: Following findings were obtained from the study:

Table 2: Showing radiological findings of the wrist injury patients:

Fracture Location	**No of Patients**	**Percentage (%)**
Extra-articular fracture radius distal end, dorsal tilt	38	76%
Extra-articular fracture radius distal end with ventral tilt	3	6%
Intraarticular radius fracture with dorsal displacement	1	2%
Intraarticular radius lower end fracture with dorsal displacement	0	0
Extra-articular along with ulnar styloid fracture	8	16%

1) Extra Articular Comminated Fracture Distal End Radius, dorsal displace and dorsal tilt (left) sided (Colle's fracture) was observed in 38 is 76% patient reports.
2) Extra Articular Comminated Fracture distal end Radius, dorsal displacement and ventral tilt (left) were seen in 3 i.e. 6% cases.
3) 8 cases i.e. (16%) cases also observed with Extra-articular fracture distal end Radius with

ventral displacement and lateral tilt (Right) with fracture of the styloid process of ulna.

4) The single case was diagnosed in X-ray with intraarticular fracture distal End radius Dorsal Displacement and Ventral tilt suggestive of Smith's Fracture.

DISCUSSION

In this study, 60% X-ray reports were observed of male patients while 40% X-ray reports were observed of female patients. It is a fact that females have oestrogen hormones which are responsible for the strength of ligaments, bones which males don't have, this could be the reason for lesser prevalence in females of fracture. As per the objective of the study, changes in structural anatomical changes have been seen in the wrist joint due to orthopaedic trauma. Careful observation of this study showed that the injury to the wrist joint causes *sandhibhagna* (fracture). Out of all kinds of fractures, the most common fracture was that of Extra-articular Radius distal end fracture with dorsal displacement of distal fragment of radius suggestive of **"Colle's fracture"** and that of left-sided found more prevalent. The less common fracture was that of Intraarticular Radius distal end fracture with Dorsal displacement of distal fragment of radius along with ulnar styloid process i.e**., "Smith's Fracture".** The third commonest fracture was the Extra Articular Radius distal end with Ventral tilt. The fourth common fracture was that of Intra Articular Radius fracture with dorsal displacement. As per a study published in the journal "Function ten years after Colle's fracture", in which displaced Colle's fractures were reviewed ten years after the injury for function, radiographic anatomy, osteoarthrosis, showed 42%patients improved functionally in ten years and 20% had deteriorated. Dorsal angulation influenced early but not ten-year function (10) Out of cases enrolled for the study, Distal end radius fracture cases were found mostly in the left hand, as it can be co-related to the lesser usage of the left hand for routine activities resulting in its relatively poor strength as compared to the right one which people use predominantly. It has been observed that the prevalence of *Sandhibhagna* (fracture) observed higher in vegetarian people compared to non-vegetarians. The higher fracture rate among vegetarians in this study appears to reflect their markedly lower mean calcium intake. As per the study, both vegetarian and vegan diets are associated with lower BMD (Bone mineral density) compared with omnivorous diets and vegans have a higher fracture risk than omnivores. The effect of vegan diets on BMD is more pronounced than the effect of vegetarian diets. Both vegetarian and vegan diets should be appropriately planned to avoid dietary deficiencies associated with bone health. (11)

CONCLUSION:

The wrist joint of the hand is a very important & complex joint. The pain during fracture is very severe and it can be co-related with *marmaghat* of *Mani bandha Marma*. It can be concluded that *Manibandha Marma* is a *Sandhi Marma* when get injured due to any sort of trauma to it, causes drastic pain, restricted movement, inability to move the joint properly & thereby causing *Kunthana* (functional deformity) to perform routine works as mentioned in *marmaghat lakshanas* of *Mani bandha sandhi* of hand. Injury causes severe *ruja* (pain) in joints as it causes fracture as well as dislocation of the structures involved, so it can be affirmed that it is a *Rujakara Marma*. For better management & prognosis, people should be advised to avoid carelessness; regular exercise along with dietary modification like high intake of nutritious Protein, Calcium, and Vitamin D3 would bring strength to bones, ligaments thereby preventing damages due to injuries or could contribute to faster recovery and great prognosis from the *marmaghat.*

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