WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 10, Issue 1, 547-556. Review Article ISSN 2277– 7105

A REVIEW ARTICLE ON MANIBANDHA MARMA WITH REFERENCE TO BASIC ANATOMY AND WRIST JOINT

Rohan Ambavkar*

C/o-Parkar Hospital, Shivajinagar, Ratnagiri Ratnagiri Maharashtra India, 415639.

Article Received on
05 Nov. 2020,

Revised on 25 Nov. 2020,
Accepted on 15 Dec. 2020

DOI: 10.20959/wjpr20211-19470

***Corresponding Author**
Dr. Rohan Ambavkar
C/o-Parkar Hospital,
Shivajinagar, Ratnagiri
Ratnagiri Maharashtra India,
415639.

ABSTRACT

Marma Sharira is the distinctive concept of Ayurveda. References of *Marma* are found in *Veda* also. *Marma* are not merely anatomical landmarks but they are present in body. Any harm to these *Marma* results in various delicate conditions. The subsequent signs and symptoms of these conditions are well-defined in Ayurved *Samhitas*. A detailed study is required to importance in modern science. This literary study was initiated to fulfill the gap. The *Samhitas* were studied for the *Marma*-related content. The secondary data are collected from the *Samhitas* as well as from online research database. Books and online research database have been used to study. The modern aspect of the wrist joint. *Manibandhaa Marma* (a *Marma* that is located in the wrist) was selected for the study. Painful wrist is a challenge for health-care providers. *Manibandhaaa Marma* is a *Rujakaraa Marma* and a *Sandhi Marmaa*. This study can help the *Ayurvediy* health professionals to understand the painful wrist with reference to *Marma Sharira.*

KEYWORDS: Basic anatomy of wrist, biomechanics of the wrist, *Manibandhaa Marma*, *Manibandhaa Sandhi*, *Marma*, painful wrist.

INTRODUCTION

Manibandhaa Marma is a *Rujakara Marma* and a *Sandhi Marma*. It comprises various components. Carpal bones, distal ends of radius and ulna, various ligaments, tendons, and nerves are situated in the area of wrist joint. An injury to these components results in painful conditions of wrists. These conditions are mostly irreversible and that is the reason why Acharya Sushruta has labeled it as *Rujakara Marma*.

Marma Sharira is one of the prominent subjects in Ayurveda. References of *Marma* are found in *Rigveda*.[1] There are 107 *Marma* located at different places all over the body. Of which, 11 *Marma* are present in the extremities, 26 *Marma* are present in the trunk, 3 in the abdomen, 9 in the thorax, 14 *Marma* are located in the back, and 37 in the head–neck region.[2],[3],[4]According to Acharya Sushruta, *Marma* are constituted by the combination of five elements. The five elements are *Mamsa* (muscle), *Sira* (blood vessels), *Snayu* (ligaments), *Asthi* (bones), and *Sandhi* (joints).[5]

For the purpose of description, the *Marma* are considered under various heads. The *Marma* are categorized according to their locations in body. They are *Shakhagata Marma* (*Marma* located in extremities), *Urahgata Marma* (*Marma* located in thorax), *Udaragata Marma* (*Marma* located in abdomen), and *Urdhvajatrugata Marma* (*Marma* located in head and neck region). Acharya Sushruta has described symptoms of injury to the *Marma* of lower limb, and he has instructed further to consider symptoms of injury to the upper limb *Marma* same as that of the lower limb *Marma*.[6]

Another type of categorization is according to the structures involved in the formation of the *Marma* (dominance of structure present at the site of *Marma*). They are categorized as *Sira Marma, Snayu Marma, Sandhi Marma, Asthi Marma,* and *Mamsa Marma*. According to Acharya Sushruta, *Marma* are the locations that have confluence of *Mamsa, Sira, Snayu, Asthi*, and *Sandhi.*

An injury to the *Sadya Pranahara Marma* causes death within 7 days. An injury to the *Kalantara Pranahara Marma* causes death within 2 weeks to 1 month.[8] *Vishalyaghna Marma* does not cause death until the weapon is inside the *Marma* location. If the weapon or the foreign body is removed forcibly, then the removal causes death of the patient. If the weapon remains in the *Marma* location till it falls at its own *Paka* (putrefaction) of the wound, then the patient survives. *Vaikalyakar Marma* are those locations that cause deformity when injured. An injury to the *Rujakara Marma* causes pain.[9]

Mechanics is the study of force and their effect, and so is the biomechanics, a study of mechanical law on human body, and is chiefly concerned with interrelation of skeleton, muscles, and joints. The wrist consists of two joints, the radiocarpal and midcarpal joints, referred collectively as the wrist complex. Hence, a study of both the joints has to be done.[10]

Although many researchers have studied the wrist complex using biomechanics but due to its complex nature, there are still many unknown facts or unrevealed truths about the joints.[13] The study for this article is about *Manibandhaa Marma.* It comes under *Shakhaghata Marma* (located in extremity), *Sandhi Marma* (dominancy of joints is observed), and *Rujakara Marma* (based on the effect of pain). It is a *Rujakara Marma*. *Rujakara Marma* is the category that is based on the effect of injury. Eight *Rujakara Marma* are mentioned, of which four are situated in upper extremity, namely *Manibandhaa* and *Kurchashira* (a *Marma* located near wrist joint), and four in lower extremity, namely *Gulpha* (a *Marma* located in ankle joint) and *Kurchashira* (a *Marma* located near ankle joint).[14]

An injury to *Manibandhaa Marma* causes *Ruja* (pain) and *Kunthata*, which means loss of function.

Acharya Sushruta has defined the types of *Sandhi* (joints), and *Manibandhaa* is a *Kora Sandhi* (hinge joint) according to his classification of joints.[15]

Manibandhaa Marma is located in the *Manibandhaa Sandhi*, that is, wrist joint. According to *Ghanekar Tika* (a commentary on *Sushrut Samhita*), *Manibandhaa Marma* is located in wrist joint, which includes both radioulnar and radiocarpal joints. *Rasayog Sagar* interprets *Manibandhaa Marma* as intercarpal ligaments. As *Manibandhaa Marma* is a *Sandhi Marma*, overall joints should be considered in case of *Manibandhaa Marma* and not just the ligaments.[6]

Anatomical and functional complexities of the wrist are getting more attention in past few years. To apprehend the mechanism of any joint, a systematic understanding of its anatomy is required, various imaging techniques have been used to make clear the three-dimensional associations among the different soft tissue structures of the wrist along with the accompanying joints. The wrist is conventionally defined as a solitary joint, but it is a complex joint. Movements of the joint are the result of the addition of interactions of the every carpal bone among themselves at the same time. The movements take place with the distal articulating surface of the radius as well as the triangular fibrocartilage complex of ulna proximally and distally with bases of the metacarpals. The eight carpal bones are arranged in two rows, that is, a proximal row and distal row. Starting from radius, the proximal row is arranged in a sequence. The sequence is the scaphoid, lunate, triquetrum, and pisiform, whereas the trapezium, trapezoid, capitate, and hamate are in the distal row.[16]

The radius carries 80% of the axial weight of the forearm approximately, by means of its articulation with the carpus laterally, and remaining axial load of the forearm is carried by the ulna through its joints with the medial carpus (via the triangular fibrocartilage complex).[17]

The major contribution of wrist complex is to control length–tension relationship in multiarticular hand muscles and to allow fine adjustment of grip. The wrist muscles appear to be designed for balance and control rather than torque maximizing production. The length–tension relationship occurring at wrist cannot be replaced by any other joint. The range of motion (ROM) of entire complex is variable and reflects the difference in carpal kinematics that arise from such factors as ligamentous laxity, shape of articular surface, and constraining effects of muscles. The two joint system rather than single joint system of that complex:

1. Permitted large ROM with less exposed articular surfaces and tighter joint capsule.
2. Less tendency for structural pinch at extreme of ranges.
3. Allowed for flatter multi-joint surface those are more capable of withstanding imposed pressure.[10]

Most common injuries

Injuries are categorized into acute injuries and chronic injuries. Acute injuries are traumatic, and chronic injuries are due to overuse of the hand and wrist.

Traumatic injuries mostly occur in athletes. Particularly those who involve in sports that have need of greater levels of maneuver (for example, golf, tennis, and baseball). Broken bones, joint dislocations, muscle strains, sprains, ligament tears, and tendon inflammation are some common traumatic injuries.

The wrist joint is essentially a synovial joint between the distal end of radius and proximal row of carpal bones by strong triangular ligament. A fall on outstretched hand can strain the anterior ligament of wrist joint, synovial effusion, joint pain, and limitation of movement.[18]

Dislocation of lunate

Lunate is dislocated when a person falls on the hand with acute dorsiflexion and a flexed forearm. The force displaces the lunate anteriorly, causing carpal tunnel syndrome (CTS). It is so common that carpal dislocations often remain unrecognized or mismanaged. There is a difference of opinion about the management of these injuries and about the expected results from management even today.[19]

Kienbock's disease

Kienbock's disease in which, necrosis of the lunate occurs, is a progressive disease process. The disease leads to dysfunction of the wrist along with pain. Traumatic, anatomic, vascular, and mechanical factors have been supposed to be responsible for the disease. This necrotic disease of lunate remains a challenging problem for surgeons.[20] This disease is also considered as osteochondritis of lunate. Pain in the wrist is aggravated by active use of wrist.[21] Kienbock's disease has been associated with ulnar negative variance that is the short ulna in comparison with radius at distal end, which also affects the functioning of radiocarpal joint.[22]

Fracture of the scaphoid

Scaphoid is the most commonly fractured carpal bone. Clinical presentation is swelling and tenderness in the anatomical snuff box. Delayed union or nonunion are common complications. Avascular necrosis of the proximal fragment is the result of these complications.[23]

Metacarpal fractures

Wrist joint is the bridge between hand and forearm. It shows movements along six axes. Injury to the structures present distally to it would affect its movement causing pain. There is a variety of fractures that occur at the base of the first metacarpal bone. Bennett's fracture is the best known fracture. Rolando described a group of more comminuted fractures involving the CMC joint in 1910. Roberts mentioned transverse fractures at the lower end of the metacarpal bone in 1938 reviewing all the fractures that occur in the hand.[24] Boxer's fracture is the fracture of the neck of a metacarpal, most commonly through neck of the fifth metacarpal. A spiral displaced fracture of base of fifth metacarpal bone may cause damage to deep branch of ulnar nerve.[23]

Carpal tunnel syndrome

CTS is an entrapment syndrome. It is triggered when median nerve is compressed in carpal tunnel. This compression in the carpal tunnel is believed to cause venous congestion, which results in nerve edema and anoxic damage to the capillary endothelium of the median nerve itself. CTS is most commonly occurring syndrome in the nerve compression syndromes. Pain, which is the common symptom in CTS, can affect patients' quality of life.[25]

Injuries to the wrist in athletes are very usual in competitions of all levels. One-fourth of all injuries in sports are found in the wrist joint. Wrist injuries are common in sportspersons as hand is in front of the athlete and absorbs shock in most of the sports. A sportsperson uses his hand to deflect and absorb the power of the rivals, the ground, and balls of various shapes and sizes.

Wrist injuries are most common in teenage and adolescent athletes in comparison with the adult athletes. Although in athletics, there is a new level of refinement in the diagnosis and treatment of injuries of soft tissue in wrist, the complexity of the joint, and these injuries remain difficult for diagnosis and treatment.

The complex anatomy, interrelated and closely situated structures, and highly forceful movements of this joint also make it difficult to study from a biomechanical viewpoint. Thus, the availability of scientific data on the subject of the wrist in sports to assist the clinician is very less.

A failure in analysis, management, and rehabilitation of an athlete's wrist may result in unnecessary delays in his return in the game or can result in permanent decline in his performance. In addition, wrong diagnosis or incorrect treatment may result in irreversible damage, thus limiting even daily activities.[26]

Chronic injuries: These are overuse injuries and are stress induced. The injuries include nerve injury, dislocation, tendon inflammation, and overuse stress fractures. Wrist joint becomes painful due to tendinitis, CTS, fractures of carpals, and phalanges. These injuries are observed in musicians, computer operators, knitters, and so on. According to Acharya Sushruta, if any injury in nearby area causes the same symptom to that of particular *Marma*, then the injury should be considered as an injury to the *Marma*. Hence, injury to structures present proximally of the wrist joint such as the phalanges on injury show symptoms such as pain, stiffness, and loss of function, which are found when the *Manibandhaa Marma* is affected.[27] Repetitive strain injuries (RSIs) are termed as cumulative trauma disorders (CTDs) consequential from continued forceful, repetitive, or awkward movements. The movements cause damage to the muscles, nerves, and tendons. These injuries are also termed as repetitive stress injuries, occupational overuse injuries, repetitive motion disorders, CTDs, and occupational musculoskeletal disorders. RSIs are known as CTS and tendinitis also, which are well-defined disorders, or lesser known conditions such as tension neck syndrome.

It is constantly evident from many studies that there is a relation between forceful manual exertions, repeated hand motions, and hand and arm vibration with CTS and tendinitis of hand and wrist.[28]

Manibandhaa Marma falls under the category of *Rujakara Marma* on the basis of effect-wise classification. *Ruja* the word stands for pain. *Rujakara Marma* shows the dominance of *Agni* and *Vayu* element in its *Panchbhautik* composition. *Rujakara Marma* if injured causes tremendous pain and if not treated properly can lead ultimately to deformity. Hence, any injury at the site of *Manibandhaa Marma* causes tremendous pain and stiffness of hand.

DISCUSSION

Manibandhaa Marma comprises various components. Carpal bones, distal ends of radius and ulna, various ligaments, tendons, and nerves are situated in the area of wrist joint. According to Acharya Sushruta, it is a *Sandhi Marma* and a *Rujakara Marma*. Any injury to the wrist joint can make the joint painful. The injury can result in the loss of function of the joint. Though *Manibandhaa Marma* is a *Sandhi Marma*, various ligaments and cartilages are also involved in the joint. These components are equally responsible for painful conditions of the wrist. Hence, all the components of the joint should be considered as a part of the *Manibandhaa Marma.* In addition to this, the structures present in its vicinity, which may or may not have direct relation with it should also be taken under consideration. The complexity of the joint anatomically and biomechanically makes it difficult to treat and cure. In any kind of injury, the structure affected shows its impact on the neighboring structure. This proves the coupling between structures, which directly results in the functioning of the complex that is hampering its biomechanics. The main focus of this complex is to provide equilibrium in grasping action of the hand.

To establish this equilibrium and counteract on the force exerted by the muscles on objects, four prime muscles of grasping have been designed. Hence, any kind of injury to the muscle or deformity to the neighboring structure would affect the grasping action. All the aforementioned reasons are responsible for loss of function, which is stated as *Viddha Lakshan* by Acharya Sushruta.

The injuries can be sudden or it can be seen in the form of prolonged and continuous usage of the joint. Sudden injuries and acute pain occur in sportspersons, whereas chronic pain is seen

in prolonged and overuse of the wrist joint, for example, computer keyboard users, knitters, and writers.

Wrist joint is one of the most used joint of the human body. Forceful and repetitive stress injuries result in damage to the components of the wrist. Hence, the joint is more vulnerable to the injuries, and the wrist can become painful even with repeated low impact injuries.

In the era of all the modern techniques of diagnostics and much advanced treatments, the painful wrist is still proving a challenge to the clinicians and surgeons. All these conditions indicate that Acharya Sushruta has perfectly tagged the wrist as a *Rujakara Marma*.

CONCLUSION

Wrist joint is posing a major cause of concern in athletes as well as in repetitive users of the wrist in spite of having high-end medical diagnostics and treatments. A thorough review of basic anatomy and biomechanics of the wrist provides the evidences of instability of the joint and hence proves its *Rujakaraatva* (tendency to remain painful). This literary research can provide the clinicians with the data, which suggests that they must train their athlete patients or the people who have to use their hand repeatedly, to be very cautious for their wrists, as it may take considerable time to recover from the inflammatory and painful conditions and delay their return to normal work.

REFERENCES

1. Kumari NV, Susheela P, Anju V, Om S, SK S. Marma and Marma therapy: A review. World J Pharm Res, 2018; 7: 258-71.
2. Agnivesha, Charaka, Chandrika. chapter In: Tripathy B, editor. Charaka Chandrika Hindi Commentary. Varanasi, India: Chaukhambha Surbharti Prakashan, 1998; 26(3): 862-2.
3. Sushruta Susrutasamhita sharira sthana: chapter In: Ambika Dutta SK, editor. Ayurveda Tatvasandeepika Hindi Commentary. Varanasi, India: Chaukhambha Sanskrit Sansthan, 2014; 6(3): 71-1.
4. Vagbhata. Astangahridya sharira sthana: Chapter New Delhi, India: Chaukhambha Publications, 2017; 428(4): 1-3.
5. Susrutasamhita. Susrutasamhita. In: Ambikadutta SK, editor. Ayurveda Tattva Sandipika. Varanasi, India: Chaukhambha Sanskrit Sansthan, 2014; 69: 1-1.

6. Sushruta Susrutasamhita sharira sthana: chapter In: Garbha Vyakaran Shariropakram Adhyaya. Hindi commentary by Dr. Bhaskar Govind Ghanekar. Reprint ed. Varanasi, India: Meharchand Lachhmandas Publications, 2017; 192: 6-32.
7. Sonune AM, Karle GS, Vikhe BC, Pande PP. Observational study of *Manibandhaa Marma* and its location with special reference to wrist pain. WJPR, 2016; 6: 691-7.
8. Sushruta Susrutasamhita sharira sthana: chapter In: Garbha Vyakaran Shariropakram Adhyaya. Hindi commentary by Dr. Bhaskar Govind Ghanekar. Reprint ed. Varanasi, India: Meharchand Lachhmandas Publications, 2017; 190: 6-30.
9. Sushruta. Susrutasamhita sharira sthana: chapter In: Garbha Vyakaran Shariropakram Adhyaya. Hindi commentary by Dr. Bhaskar Govind Ghanekar. Reprint ed. Varanasi, India: Meharchand Lachhmandas Publications, 2017; 186: 6-23.
10. Levangie PK, Norkin CC. Wrist complex. In: Joint Structure and Function. New Delhi, India: Jaypee Brothers Medical Publishers, 2012; 5: 306.
11. Chaurasia BD. Human Anatomy. New Delhi, India:Medicos Ideas, 2018; 5: 158. Levangie PK, Norkin CC. Wrist complex. In: Joint Structure and Function. New Delhi, India: Jaypee Brothers Medical Publishers, 2012; 5: 310.
12. Omokawa S, Lida A, Kawamura K, Nakanishi Y, Shimizu T, Kira T, *et al*. A biomechanical perspective on distal radioulnar joint instability. J Wrist Surg, 2017; 6: 88-96.
13. Sushruta Acharya. Susrutasamhita In: Acharya VYT, Acharya NR, editors. Varanasi, India: Chaukhambha Sanskrit Sansthana, 2013; 370: 824.
14. Sushruta. Susrutasamhita sharira sthana: chapter In: Ghanekar BG, editor. Garbha Vyakaran Shariropakram Adhyaya. Varanasi, India: Meharchand Lachhmandas Publications, 2017; 165: 5-32.
15. Berger RA, Garcia-Elias M. General anatomy of the wrist. In: Biomechanics of the Wrist Joint. New York, USA: Springer, 1991; 1-22.
16. Palmer AK, Werner FW. Biomechanics of the distal radioulnar joint. Clin Orthop Relat Res, 1984; 187: 26-35.
17. Snell RS. Snell's Clinical Anatomy by Regions. 9th South Asian ed. New Delhi, India: Wolters Kluwer, 2012; 411.
18. Robert DC, Lance EM, Yeoh CB. Lunate and perilunar dislocations. J Bone Joint Surg Am, 1964; 46: 55-72.
19. Lutsky K, Beredjiklian PK. Kienböck disease. J Hand Surg Am, 2012; 37: 1942-52.

20. Ramesh Babu CS. Essentials of Clinical Anatomy. New Delhi, India: Academia Publishers, 2004; 5: 88.
21. Levangie PK, Norkin CC. Wrist complex. In: Joint Structure and Function. New Delhi, India: Jaypee Brothers Medical Publishers, 2012; 5: 309.
22. Ramesh Babu CS. Essentials of Clinical Anatomy. New Delhi, India: Academia Publishers, 2004; 5: 89.
23. Griffiths JC. Fractures at the base of the first metacarpal bone. J Bone Joint Surg Br, 1964; 46: 712-9.
24. Damms NA, McCallum LM, Sarrigiannis PG, Zis P. Pain as a determinant of health-related quality of life in patients with carpal tunnel syndrome; a case-controlled study. Postgrad Med, 2020; 132: 52-5.
25. Werner SL, Plancher KD. Biomechanics of wrist injuries in sports. Clin Sports Med, 1998; 17: 407-20.
26. Sushruta. Susrutasamhita sharir sthana: chapter In: Ghanekar BG, editor. Garbha Vyakaran Shariropakram Adhyaya. Hindi commentary by Dr. Bhaskar Govind Ghanekar. Reprint ed. Varanasi, India: Meharchand Lachhmandas Publications, 2017; 203: 6-52.
27. Nainzadeh N, Malantic-Lin A, Alvarez M, Loeser AC. Repetitive strain injury (cumulative trauma disorder): Causes and treatment. Mt Sinai J Med, 1999; 66: 192-6.