Original Research Paper

Volume - 13 | Issue - 08 | August - 2023 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Ayurveda

CONCEPT OF KRIKATIKA MARMA WITH ITS APPLIED ASPECTS

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ABSTRACT Ayurveda is mother of all medical sciences and has been authentic source of knowledge covering its different aspects. Acharya Sushruta has contributed to the field of surgery by introducing the concept of marma i.e. vitally essential areas of body which we can regard as ancient traumatology. There are 107 marma points in human body among which Krikatika marma is one. Being a sandhi marma, it is mainly constituted by joints, located at cranio-cervical junction. The extent of its vulnerable area is approximately half angula (1cm). Injury of this marma manifests in chalmurdhata i.e. instability of cranio-cervical joint. Actually cranio-cervical joint is further constituted by atalanto-occipital and atalanto-axial joints. Cranio- cervical junction has unique kinematic properties enabling it to perform complex motions. In this article we will discuss about fundamental concept of Krikatika marma and its applied aspects with special emphasis on causes, mechanism and outcome of cranio-cervical injury rendering it unstable. This systematic review will helps us to prove relevance of Sushruta's ancient concept of marma in this modern age and vulnerability and anatomico-clinical importance of krikatika marma .

KEYWORDS : Krikatika marma, cranio-cervical junction, Chala-murdhata, atalanto-occipital joint, atalanto-axial joint.

INTRODUCTION

Modernized world along with its rushing hustles is paving a new risk of trauma in day-to-day life extending from inside in-home to road traffic accidents. Trauma not only effects daily life routine, productivity and earning capability but also psychological pressures. Concept of Marma is refined form of ancient traumatology which covers 107 vital points of the human body. These anatomical locations are vital in the sense that any injury to these parts can lead to sudden death, death within some days, debilitation and pain. Out of 107 vital points, krikatika marma is one which is situated on shirogreeva sandhane i.e. at cranio-cervical joint on the neck so it is sandhi marma i.e. vital point constituted by joints. Injury of these marma leads to condition called chalmurdhata which means instability of cranio-cervical junction[1]. These joints are involved in various movements of neck. The joints of cranio- cervical junction have unique kinematic properties that contribute to the complex motion exhibited by neck and head. When the elements of these joints get affected by the trauma, they disrupt the stability of cranio-cervical junction. Various clinical and experimental observational studies help to substantiate the traumatic effect of krikatika marma.

AIM AND OBJECTIVE

Aim of this study is to find out relevance of Krikatika marma with reference to modern traumatology by finding out vital structures involved and to ascertain its applied importance.

Anatomy Of Krikatika Marma

The vital points (marma) comprise matrix of mamsa (muscular tissue), sira (vascular tissue), snayu (nervous or connective tissue), asthi (bone/cartilage), sandhi (joints) between which prana (vital energy) resides. In each marma there is a dominancy of one or another of the above elements (mamsa, sira etc). Depending upon the dominancy of the involved structures, the clinical symptoms are manifested. Different marma exhibits different grades of severity. Further severity depends upon the involvement of area of that marma because each marma is having its own dimensions. If peripheral area of the marma is injured then different clinical outcomes occur. Out of fourteen marma are present in the neck region, krikatika are two of them, located at the junction of shira (head) and greeva (neck)1 constituted by sandhi (joints) and measures only 1 cm (half angula) dimension. Injury to this manifests into chalmurdhata (loss of stability of head), therefore this is included under vaikalykara marma(deformation) category.

Cranio-cervical Junction[2]

Krikatika marma is located in the region of cranio-cervical junction. The crani-ocervical junction represents the complex transitional zone between the cranium and the cervical spine. The cranio-cervical junction is composed of two major joints: the atlanto-occipital joint and the atlanto-axial join. It is composed of osseous structures articulated with synovial joints and held together by intrinsic ligaments, membranes and muscles. These two joints are responsible for the majority of the movement available in the entire cervical spine and the anatomical structure of each is based on different biomechanical principles. The mechanical properties of the atlanto-occipital joint are primarily determined by bony structures, whereas those of the atlanto-axial joint are primarily determined by ligamentous structures. As well as housing the spinal cord and multiple cranial nerves and vasculature supplying both the brain and the cervical spinal cord. As a result, injury to the cranio-cervical junction carries the potential for devastating morbidity and mortality.

Stabilizing Ligaments[3]

- Alar ligaments-These paired ligaments attach the axis to the base of the skull. Functionally, the alar ligaments play an important role in strapping the occiput-C1-C2 complex together.
- Transverse ligament- The transverse ligament of the cruciform ligament complex is largest, thickest and crucially the strongest of the cranio-cervical junction ligaments and therefore, a primary stabilizer of the cranio-cervical junction. Transverse ligament permits rotation at the atlanto-axial joints while, at the same time, the alar ligaments will prevent excessive rotation.
- Tectorial membrane- This thin structure represents an upward extension of the posterior longitudinal ligament. It forms the posterior border to the supra-odontoid space or apical "cave" and runs posterior to the cruciform ligament.
- Posterior atlanto-ocipital membrane- Posterior atlanto-occipital membrane attaches the posterior arch of the atlas to the posterior margin of the foramen magnum. It is continuous with the posterior atlantoaxial membrane and, subsequently, the ligamentum flavum myoligamentous complex. An important consideration in trauma of this component of the cranio-cervical junction is the vertebral artery which pierces the posterior atlanto-occipital membrane.
- Nuchal ligament (ligamentum nuchae)-This is a cephalic extension of the supraspinous ligament and extends from the spinous process of the C7 vertebra attaching to the union of the occipital bone. It limits hyper flexion of the cervical spine.

Possible Sources Of Injury

- Inertial Motor vehicle injury (Whiplash injury)
- Fall from height Sudden fall on back of neck
- Assault
- Sport injuries
- Combat sport injuries
- Axial loading(Bearing excessive on head)
- Hyper mobility(Excessive exercise)
- Overuse injuries
- Wrong posture and overstretching
- Stress, strain and spasm of neck muscles

Clinical Menifestations Of Injuries[5]

Basi-occiput fracture- neurological, brain- stem, vascular, internal carotid, cranial nerve. Can also cause hematoma.

Occipital condyle fracture- Excessive axial loading may be cause of this injury. brain stem and lower cervical nerve injury, hypoglossal nerve and vertebral artery injury.

Atalanto-occipital dislocation- Due to relatively wide cross-sectional area of the spinal canal at the CCJ, spinal cord injury is less common.More prevalent in pediatrics due to underdeveloped ligaments. May also associated with cerebrovascular injury.

Atalanto-occipital subluxation Fracture of atlas- injury to vertebral artery, cranial nerve and cervico-medullary parenchymal injury .

Fracture of axis- associated with neurological mortality and morbidity. Includes odontoid and hangman's fracture.

Ligament injury without fracture-These are usually non diagnosed and under diagnosed. If not treated have long term effects.

Transverse ligament- can lead to anterior translational instability of the C1-2 vertebra.

DISCUSSION

Every marma of our body is a point where vital energy resides. Krikatika marma is a structure of high surgical importance because complex anatomical structure of the neck balances much needed stability with profound degree of movements. It mounts most important organ of our body, uttamanga i.e. head. This complexity makes neck vulnerable and surgically important.

Krikatika marma is located in the region of cranio-cervical junction which comprises atalanto-occipital and atalanto-axial joint. The junction between the skull and the cervical vertebrae is stabilized by ligaments joining the axis and atlas to the clivus, occipital bone, and occipital condyle. The cranio-cervical junction must accommodate a wide variety of motions, which require ligaments for stabilization. Atlanto-occipital joint is stabilized by an articular capsule. The anterior atlanto-occipital membrane serves to prevent excessive neck extension. The alar ligaments limit contra lateral flexion and axial rotation at the atlanto-occipital joint. The apical ligament attaches from the tip of the odontoid process to the basion. The Barkow ligament connects the tip of the dens to the occipital condyle and it assists in preventing excessive neck extension. The transverse occipital ligament sometimes joins the alar ligaments and may help prevent excessive lateral bending, flexion, and axial rotation. The cruciform or cruciate ligament limits lateral motion of C1 relative to the dens and prevents posterior dis- placement of the dens, thus limiting anterior C1- 2 subluxation to 3-5 mm. The tectorial membrane limits both excessive flexion and extension[3].

We can designate chalmurdhata as cranio-cervical instability which further includes cranio-cervical instability due to either atalanto-occipital instability or atalanto-axial instability or both. It can be mainly due to ligament injuries causing dislocation, subluxation, hypermobility and loss of sense of balance of head etc. Injury to cranio-cervical junction can directly or indirectly produce instability which may be directly due to injury causing laxity of ligaments and indirectly by poor control or poor sense of head position. Any structure which is more movable less is stable and less is stable more is vulnerable. Atalanto-occipital Joint more stable than Atalanto-axial Joint, so Atlanto-axial Joint is more vulnerable for instability. Vikalata can be attributed as irreversible destabilizing deformity. Vikalata is produced by destruction of stabilizers, snayu. All ligaments are more or less responsible for stability of cranio-cervical junction, but we will choose out most appropriate one on the basis of clinical significance is destabilization. Chal murdhata-instability of head can also be due to poor sense of head and neck position and feeling of instability i.e. in case of alar ligament injury. Together with the transverse ligament the alar ligaments are primary stabilizers of the cranio-cervical junction. Under the heading chalmurdhata we include dislocation, sub- luxation, instability, hyper mobility, loss of sense of balance of head. Trauma generated deformity persists long term due to fact that ligament have poor blood supply and are not usually regenerated naturally. Imaging of blunt traumatic injuries of cranio-cervical junction is difficult and is often under diagnosed. There is always a risk for other critical injuries related to vital neighboring structures such as vasculature, brain stem, cranial nerves and spinal cord. An under- standing of bony and ligamentous injury pat terms can assist greatly in predicting risk for other critical injuries related to vital neighboring structures such as vasculature, brain stem, cranial nerves and spinal cord.

This discussion substantiates the Sushruta's clinical view about this Marma i.e. Chalmurdhata. This clinical observational data helps to determine the structure to be included under this Marma. They are atlanto-occipital joint, Atlanto-axial joint, the tectorial membrane, the alar ligament, the cruciate ligament, the apical ligament, capsular ligament, accessory atlanto-axial ligament, the anterior and posterior atlanto-occipital membranes, Posterior ramus of C1,vertebral artery. These all structures are arranged bilaterally in a very small area i.e.in half angula circumference. Depending on the involvement of side these are giving rise to the symptoms. Out of all ligaments, transverse ligament is most important. Treatment decisions whether it will be conservative or surgical are often based on the integrity of the transverse ligament. Second most important ligament is alar ligament.

CONCLUSION

From above discussion following conclusions can be drawn- Krikatika can be compared with cranio-cervical region Krikatika marma being a sandhi marma, can be compared with cranio-cervical junction which consists of atalanto-occipital joint and atalanto-axial joint with its surrounding ligamentous structures attached to the same within 1cm (half angula) area on either side and underlying in depth of 1 cm can be included under the term krikatika marma.

Out of all anatomical structures, ligaments are most important because they are main stabilizers of joints and are vulnerable to injuries.

Out of atalanto-occipital joint and atalanto- axial joint, atalanto-axial joint is more movable contributing more towards vulnerability of cranio-cervical junction.

Out of all ligaments, transverse ligament and alar ligament is most important because treatment decisions whether it will be conservative or surgical are often based on the integrity of the transverse ligament and alar ligament.

We can designate chalmurdhata as cranio- cervical instability which further includes cranio-cervical instability due to either atalanto-occipital instability or atalanto-axial instability or both. It can be mainly due to ligament injuries causing dislocation, sbluxation, hypermobility and loss of sense of balance of head etc.

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