



Review Article

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A REVIEW ON SHOULDER DISLOCATION: SUSHRUTA'S VIEW

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ABSTRACT

Ansa Sandhimukta (Shoulder Dislocation) is the most common dislocation of a major joint of the body, accounting for up to 45 % of dislocations. It is usually found in young age (21-30 years) in males and in old age (61-80 years) in females. Recurrent shoulder dislocation and axillary neurovascular injuries are the common complications of shoulder dislocation and are mostly found in adolescence. The usual causes of shoulder dislocation include falls, contact sports, collisions, electric shock, etc. *Ayurvedic* treatises, especially *Sushruta Samhita* has described *Ansa sandhimukta* very well in the chapters of "*bhagna*". The present article is focused on the description of *Ansa sandhimukta* in a systematic manner on the basis of the references given by *Acharya Sushruta*. The various etiological factors, mechanisms, clinical features, classification and treatment of *Ansa sandhimukta* have been explored with possible modern interpretation. *Ansa sandhi* is closely related to various *marma* sites (vital spots), therefore, complications of *Ansa sandhimukta* have also been explored. Although, with the advanced technologies, the principles of shoulder dislocation have taken a tremendous leap, but the concepts mentioned in *Ayurveda* stand valid even today.

Keywords: *Ansa Sandhimukta*, Shoulder Dislocation, *Sushruta Samhita*, contact sports, *bhagna*, *marma*

INTRODUCTION

Ansa Sandhi (Shoulder joint) in *ayurveda* is described as *cheshtavanta sandhi*, i.e., a freely movable joint. It is also known as *kaksha sandhi* (*kaksha*– arm pit). Furthermore, it is considered as '*ulukhala*' type of *sandhi* in which a rounded ball-shaped part of a bone (pestle) fits into a cup-shaped socket (mortar).¹ This is simply the ball-and-socket variety of the synovial joint in which the rounded head of humerus articulates with the glenoid cavity of scapula. It is a multi-axial joint with very high mobility in all the planes. The stability of the shoulder joint is compromised at the cost of its increased mobility. Structurally, the articular capsule of the shoulder joint is relatively weak anterior; due to which the humeral head dislocates to the anterior more often than not. Because of these reasons, it is the most vulnerable joint to get dislocated.² Shoulder dislocations have traditionally been treated by closed reduction methods which include traction techniques, leverage techniques or manipulation methods. The success rates of closed reduction techniques range from 70 % - 90 %. With the introduction of the radiological techniques like X-rays, computerized tomograms and magnetic resonance imaging, a much clear picture of the shoulder injuries can be revealed. The etiological factors with possible mechanism of injury can be better understood. In fact, various new classifications of shoulder dislocation have been introduced. Injuries like Bankart lesion, Hill Sachs lesion, intra-thoracic dislocations, etc. are easily diagnosed nowadays and with a much better picture. Subsequently, the surgical procedures including soft tissue repairs, arthroplasty, capsulorrhaphy, etc. have also come into the scene.

Although, modern science has advanced remarkably in the context of shoulder dislocation but the oldest reference of shoulder dislocation dates back to the time of *Acharya Sushruta*.

Sushruta has described the shoulder dislocation as "*Ansa Sandhimukta*" in the *bhagna prakarana* of his book "*Sushruta Samhita*" (1500-1000 BC). *Acharya Sushruta* has categorized *bhagna* into two types, i.e.; *kandabhagna* (Fracture) and *sandhimukta* (Dislocation). *Sushruta* has mentioned the dislocations which occur in various joints of the body. He has further described the etiology, classification, clinical features and treatment of *sandhimukta*. These are equally applicable to the *ansa sandhimukta*.^{3,4}

The present article deals with the concepts of *Sandhimukta* (a type of *bhagna*) at a specific site, i.e., *ansa* (shoulder) in *Ayurvedic* literature, *Sushruta Samhita* and the possible modern interpretation of these concepts. To establish this, the relevant modern literature has also been explored. The practical utility of these principles in the management of shoulder dislocation at the present time have also been discussed.

Etiology of *Ansa sandhimukta*

Acharya Sushruta has given a common etiology for "*Sandhi mukta*" (Dislocation) in *nidana sthana* of *bhagna prakarana*.³ The dislocation of *ansa sandhi* occurs as a result of trauma due to *prapatana* (fall), *prahara* (direct blow from an object), *aakshepana* (*atishayena chaalanam*– excessive movement as in throwing or seizures or electric shock) and *prabhriti* (*balvadvigrahaadinama avrodha*- fighting with stronger person).^{5,6}

Prapatana (fall) on an outstretched hand with shoulder in abduction and external rotation or adduction and internal rotation may result in popping out of the humeral head either anteriorly (anterior dislocation) or posteriorly (posterior dislocation), respectively.⁷⁻⁹ When the head is driven forwards, it leads to a tear

of capsule or an avulsion of glenoid labrum (Bankart lesion).⁷ A fall from height on the upper limb may force the humeral head superiorly from the glenoid fossa resulting in superior dislocation. A fall with a severe hyper-abduction force on arm may lever the humeral head below the glenoid cavity resulting in inferior dislocation.¹⁰ *Prahara* (direct blow) to the shoulder may drive the humeral head either anteriorly or posteriorly according to the direction of force. This may occur in athletics or sports collisions and motor vehicle collisions.⁷⁻⁹ *Aakshepana* leads to a sudden excessive movement of the shoulder such as a throw, a seizure or an electric shock.^{8,9,11} While throwing an object or hitting a volley ball (vulnerable position of shoulder, i.e., the arm held over the head with the elbow bent), a force is applied that pushes the elbow backward and levers the humeral head out of the glenoid fossa.¹² Seizures (neurological disorders) and electric shock in electroconvulsive therapy also lead to posterior dislocation.^{8,9,11} *Prabhriti* (*balvadavighraha*), i.e., fighting against a stronger person usually results in posterior dislocation of the shoulder. This mechanism usually occurs in sporting events such as wrestling and American football in which arms are kept outstretched during blocking.^{8,11}

Classification of *Ansa sandhimukta*

Acharya Sushruta has classified *Sandhimukta* (Joint Dislocation) into 6 types, viz., *utpishta*, *vishlishta*, *vivartita*, *avakshipta*, *atikshipta* and *tiryakshipta*.³

Shoulder instability in modern times is classified in various ways:

Volition: Voluntary, Involuntary.

Severity: Dislocation, Subluxation.

Etiology: Traumatic, Micro-traumatic, Atraumatic, Neuromuscular.

Direction: Anterior, Posterior, Inferior, Superior, Bidirectional, Multidirectional. Anterior shoulder instability (96 %) is further of Pre-glenoid, Sub-glenoid, Sub-coracoid, Sub-clavicular and Intra-thoracic types. Posterior shoulder instability (2-4 %) is classified as Sub-acromial, Sub-glenoid and Sub-spinous types. Inferior (*luxatio erecta*) and superior shoulder dislocations are rare, accounting for approximately 0.5 % of cases. Instability of shoulder can be in two (bidirectional) or more directions (multidirectional).

Chronicity: Acute, Chronic.

Frequency: Initial, Recurrent.¹³

From the above description, it is evident that *Sushruta* has classified dislocation according to the direction and severity of the displacement of the bone involved. In *Utpishta* type, swelling and pain occurs on either side of the joint with various types of pain specially occurring at night.^{3,14} *Acharya Dalhana* has mentioned "*utpishte churnite*" (crushing) as a feature of *Utpishta*.^{5,6} This occurs in a fracture dislocation of the shoulder joint. The Hill-Sachs lesion (a compression fracture of the postero-supero-lateral humeral head), the bony Bankart lesion (a small piece of glenoid is avulsed either anteriorly or posteriorly), the un-displaced neck fracture, and greater tuberosity fractures of proximal humerus are common fractures associated with shoulder dislocation.^{8,13,15} In *Vishlishta* type, there is a mild swelling followed by a constant pain and derangement of the joint.^{3,14} *Acharya Dalhana* has mentioned "*ghattite*" (bones involved are rubbed against each other), "*sandhivikriya madhyanimnatvam*" (reduced space due to slight derangement of bones) in reference to *vishlishta*.⁵ *Madhukoshakaar* too has mentioned "*vishlishtam manaak sandhivishleshah shithiltamatram*" (looseness of joint with slight displacement). In "*Nyaya Chandrika*" too, an important feature of *vishlishta sandhimukta* is given as "*anabhighata*", i.e., it occurs without trauma (atraumatic).¹⁶

This explanation is concomitant with the sub-luxation type of shoulder instability.¹³ In *Vivartita* (removed from its place) type, the bone displaces to the either side of the joint with visible deformity and pain.^{3,14,17} *Acharya Dalhana* has quoted "*vipritamavartite*" which means the bone leaves its place and come to lie on either side of its normal position.⁵ This can be considered as a pre-glenoid type of anterior or a sub-acromial type of posterior unidirectional instability of the shoulder joint.^{7,13} In *Avakshipta* type, there is separation of the joint and severe pain.^{3,14} *Acharya Dalhana* has mentioned "*avakshipte sandhavadhogate*" (downward displacement of the bone).⁵ This can be considered as inferior shoulder dislocation (*Luxatio erecta*).¹³ In *Atikshipta* type, the bones are displaced a long way (*atikrantata doorgamnam* by *Dalhana*) so that there is over-riding and severe pain.^{3,5,14} This occurs in the intra-thoracic dislocation of shoulder joint where the humeral head is displaced a long way (thorax). *Madhukoshakaar* has mentioned "*kshipte atiti atikshipte urdhvamiti*" (superior displacement), in reference to *atikshipta*.¹⁶ Superior dislocation of shoulder is extremely rare and may or may not be associated with humeral head fracture. Both superior and intra-thoracic dislocations occur as a result of high energy trauma.¹³ In *Tiryakshipta* type, one of the bones (humerus in shoulder dislocation) is displaced in an oblique direction and there is excessive pain.^{3,14} The sub-coracoid, sub-glenoid, sub-clavicular and intra-thoracic varieties of anterior dislocation and sub-spinous and sub-glenoid varieties of posterior dislocation, can be considered as *tiryakshipta*, because in all these cases there is some degree of oblique displacement of humeral head in relation to the glenoid cavity.¹³

Clinical features of *Ansa sandhimukta*

Acharya Sushruta has given the general features of *Sandhimukta* as *prasarana-aakunchana-vivartana-aakshepana-ashakti, ugrarujatvam* and *sparsha asahatvam*.³ All the features are concomitantly found in *Ansa sandhimukta* (Shoulder dislocation).

The patient complains of extreme pain (*ugrarujatvam*) and swelling of the affected shoulder joint. Also, the patient resents any movement of the shoulder [*prasarana* (extension), *aakunchana* (flexion), *vivartana* (circumduction), *aakshepana* (throwing) *ashakti* (inability)].^{7,9,14,18} The patient often supports the affected extremity (held in slight abduction and external rotation) with the other hand. Patients with an anterior dislocation typically have a limitation to internal rotation and abduction. Patients with a posterior dislocation often have limited abduction, external rotation and passive elevation to 90°. In *luxatio erecta*, the patient's arm may be locked in a fully abducted position.¹⁵ The contour of the shoulder becomes abnormal with a prominent acromion (flattened shoulder) and a prominence or fullness in the area of the dislocated humeral head.⁹ In fact, the patient is in such excruciating pain that he/she does not bear anyone's touch on the shoulder (*sparsha asahatvam*). There is increased apprehension and even a slight attempt in the passive movement of the shoulder joint is not tolerated by the patient.⁷

Treatment of *Ansa sandhimukta*

According to the explanation of *bhagna* given by *Sushruta*, the treatment of *Ansa Sandhimukta* includes 3 steps:

- i. *Sandhi Sthapana* (Reduction),
- ii. *Bandhana* (Immobilization),
- iii. *Sukhcheshta Prasarana* (Physiotherapy).^{4,19}

Moreover, the management mentioned by *Sushruta* is basically the non-operative management of shoulder dislocation employed nowadays.

Sandhi Sthapana (Reduction)

Acharya Sushruta has advocated the use of maneuvers such as *aanchhana* (traction), *pidana* (pressure) and *sankshepa* (to reduce/to make the bones meet) in order to reduce a dislocated joint. So, the traction is applied on the arm and pressure is applied on the axilla. *Sushruta* has mentioned the use of *musala* (a club) to accomplish this maneuver. The club is kept in the armpit which is then lifted up to bring the humeral head into its position.²⁰

Over 20 different reduction techniques have been described till date for the treatment of shoulder dislocation. However, to date there is no standard method for the closed reduction of the shoulder dislocation. The different maneuvers employed today consist of traction, leverage and manipulation methods or a combination of these. Patient's position during reduction also varies between the maneuvers as it could be done in seated, supine or prone positions (reduction maneuver mentioned by *Sushruta* seems to be in seated position of the patient).²¹ The various methods are Milch maneuver,²² Eskimo technique,²³ External rotation maneuver (Eachempati method),²⁴ Kocher's maneuver,²⁵ Hippocratic method,²⁶ Spaso technique,²⁷ Snowbird sitting method,²⁸ Stimson's maneuver,²⁹ Chair Method,³⁰ Aufmesser's method,³¹ Matsen's traction and counter-traction method,³² Bokor - Billiman's shoulder reduction technique,³³ Cunningham technique,³⁴ Scapular manipulation technique,³⁵ FARES method (Fast Reliable and Safe),³⁶ Legg maneuver,³⁷ Mane's method,³⁸ Walz method,³⁹ Boss-Holzach-Matter method,⁴⁰ Prakash method,⁴¹ De Palma's method for posterior dislocation,⁴² Slump method,⁴³ Forward pressure for posterior dislocation,⁴⁴ and Caudal Traction method⁴⁵. In addition, there are numerous modifications of the above-mentioned methods.²¹ The reduction maneuver mentioned by *Sushruta* involves a combination of traction and manipulation techniques mentioned in the modern literature. Various reduction techniques like Hippocratic method, Eskimo technique, Matsen's traction and counter-traction method, Mane's method and Walz method, use the same principle as advocated by *Sushruta*. In all these methods, a traction force is applied on the arm and some sort of force is applied on the axilla which places the humeral head opposite the glenoid cavity.

The Mane's method of reduction of the shoulder joint seems to be the closest to the one advocated by *Sushruta* as far as similarity of the maneuvers is concerned. This method was invented as the author found some of the older techniques to be too traumatic for elderly patients. It involves the following steps: 1.) Firstly, the surgeon stands behind the patient and inserts his flexed forearm into the axilla of the affected shoulder of the patient. 2.) The surgeon then applies a gentle traction to the flexed forearm of the patient with his free hand. 3.) The surgeon pulls his forearm kept in patient's axilla in a proximal and lateral direction and brings the humeral head into the glenoid socket. 4.) Finally, the traction is released.³⁸ *Acharya Sushruta* has advocated the use of a "*musala*" (instead of forearm) to accomplish the third step of the maneuver.⁴

Bandhana (Immobilization)

Acharya Sushruta has advocated the use of *Bandhana karma* once the reduction has been achieved. He has mentioned the application of *Swastika bandha* for the immobilization of the shoulder joint.⁴ In *swastika bandha*, the turns of the bandage are passed across a joint in such a way that it results in the formation of a 'cross'.⁴⁶ This is nothing but the 'spica bandage' of shoulder.⁴⁷ Bandaging has traditionally been a method used to immobilize the joints.⁴⁸ The spica bandage is used in majority of the joints including the shoulder joint. To start with, the surgeon stands facing the patient. Two circular turns are taken around the

arm opposite the axillary fold of the affected shoulder. Then, the bandage is carried diagonally across the arm and front of the chest to the axilla of the opposite side (unaffected shoulder), then around the back of the chest, across the arm, and across the upward turn to the point of origin. After carrying the bandage around the arm, this procedure is repeated with each turn overlying about two-thirds of the preceding turn until the entire shoulder is covered. The bandage may be secured by either a pin or an adhesive tape. The spica resembles a figure of 8 pattern.⁴⁷ According to *Sushruta*, the bandaging should neither be too tight nor be too loose rather be moderately tight. It should be changed at weekly intervals in cold weather, every fifth day in temperate weather and every third day in hot weather or else according to the *dosha* affecting the dislocation. It should be continued until the joint becomes stable. According to *Sushruta*, the dislocated shoulder becomes stable in one month time in children, two months' time in the middle-aged and three months' time in the elderly.²⁰ Although in the modern times, there is a controversy regarding the time of immobilization of the shoulder joint as it ranges from 2-6 weeks. A shorter period of immobilization may be used for patients older than 40 years of age to avoid stiffness of hand, wrist, elbow or shoulder.¹⁰

Sukhcheshta Prasarana (Physiotherapy)

Acharya Sushruta has not mentioned the post-immobilization physiotherapy methods for the shoulder separately. But he was well worth with the importance of the return of function of the limb/part involved. He has described the holding of a lump made up of soil or salt, etc. in the hand to strengthen it. Similarly, the movements of shoulder to regain the normal function should be done. The physiotherapy measures in post shoulder immobilization include increasing degrees of shoulder external rotation and flexion, and abduction as the time progresses. This is accompanied by full, active range of motion of the hand, wrist and elbow.¹⁰

The operative treatment of the shoulder dislocation is limited to the recurrent dislocations, the acute dislocations which are irreducible due to soft tissue interposition, the fracture dislocations (like Hill Sachs lesion, bony Bankart lesion, reverse Hill Sachs lesion, associated greater tubercle fracture with more than 5 mm displacement, or associated lesser tubercle fracture), the chronic dislocations and the open dislocations. Surgery for stabilization in the anterior instability typically involves the arthroscopic ligamentous repair of the anterior/inferior labrum (Bankart lesion). Procedures such as capsular shift, capsulorrhaphy, muscle or tendon transfers, and bony transfers are reserved for refractory cases. Surgical options for posterior instability include open reduction, infraspinatus muscle/tendon plication (reverse Putti-Platt procedure), long head of the bicep's tendon transfer to the posterior glenoid margin (Boyd-Sisk procedure), humeral and glenoid osteotomies, and capsulorrhaphy. Inferior dislocation may require open reduction when the dislocated humeral head "buttonholes" through the inferior capsule and soft tissue envelope, preventing closed reduction. Open reduction is aided with enlarging of the capsular defect and repair of the damaged structures. Irreducible superior dislocations may require open reduction.¹⁰ Arthroscopy may be required in chronic dislocations.^{49,50} The multi-directional instability is treated with open capsulorrhaphy or arthroscopic capsulorrhaphy.⁵¹ In contrast, no *ayurvedic* treatise has mentioned any operative methods for treating shoulder dislocation.

Complications of Ansa sandhimukta

Kakshadhara marma (1 on each side) and *Lohitaksha marma* (1 on each side), both lie in a close proximity to the *Ansa Sandhi*

(Shoulder joint).⁵² According to *Sushruta*, *kakshadhara marma* is located between the chest and axilla and *lohitaksha marma* is located below the lower part of shoulder joint.⁵³ So, there is every chance of injury to these *marma* sites following shoulder dislocation.

Based on the composition, the *kakshadhara marma* is a *snayu marma* (Sinew means ligamentous/tendinous/nervous structures which give support and strength).^{52,54} Hence, the predominant structures involved are capsular ligaments and the cords of brachial plexus.^{55,56} Based on the effect of injury, *Sushruta* has considered *kakshadhara marma* as a *vaikalyakara* (disabling) type of *marma*. *Vaikalyakara marmas* are *saumya* (stable and cold) in nature and protect life. Any injury to these parts is not fatal but may lead to disability. Injury to *kakshadhara marma* results into *pakshaghata* (hemiplegia).⁵² Shoulder dislocations usually cause the rupture of the capsular ligament. If the rent in the capsule is not healed, it may result in recurrent dislocation of shoulder which is the most common complication of the shoulder instability.⁷ The complications of injury to the brachial plexus following shoulder dislocation are also not uncommon. This may result in paralysis which may or may not be reversible.⁵⁷ Axillary nerve, musculo-cutaneous nerve and rarely supra-scapular nerve are among the commonly injured nerves after shoulder dislocation and during traction maneuvers.^{10,51} These may result into senso-motor neural loss of the concerned nerves. The recovery may be delayed by 6-7 months else surgical intervention is indicated for better prognosis.⁵⁸

Lohitaksha marma is categorized as a *sira marma* (vascular structures) according to its composition. According to the effect of injury, *lohitaksha marma* is a type of *vaikalyakara marma*. So, according to *Sushruta*, an injury to this site also leads to disability.⁵² The predominant anatomical structures include the axillary vessels.^{55,56} Injury or occlusion of the vessels which occur after the shoulder dislocation can lead to disastrous consequences as the blood supply to the distal structures may be compromised. The prognosis can be improved with immediate vascular repair.^{59,60}

CONCLUSION

Ansa Sandhimukta (Shoulder Dislocation) is the most common dislocation of a major joint. *Marma* sites like *kakshadhara* and *lohitaksha* are very close to shoulder. So, this injury can cause serious complications due to injury to axillary vessels and brachial plexus. *Sushruta Samhita*, the oldest treatise of *Ayurveda* on surgical principles, has described the etiology, clinical features, classification and treatment of *Ansa sandhimukta* very well. A thorough review of the literature suggests that most of the principles mentioned in *Sushruta Samhita* are same even today. The treatment mentioned by *Sushruta* is basically the non-operative treatment which is still the preferred mode of treatment in a dislocated shoulder.

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