Review Article

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A REVIEW ON *BALVATA VIGRAHA*: AN ETIOLOGICAL FACTOR FOR SKELETAL INJURIES

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ABSTRACT

“*Prabhriti*”, mentioned by *Sushruta* in *Sushruta Samhita* as one of the etiological factors of “*bhagna*” has been interpreted as “*Balvata Vighraha*” by *Dalhana* in his commentary on *Sushruta Samhita* - the *Nibandha Samgraha*. Therefore, *Balvata Vighraha* (fighting against a stronger person) can commonly cause the skeletal injuries. *Sushruta* was the first to recognize this frequent mode of trauma resulting in skeletal injuries. *Balvata Vighraha* in today's world simulates the maneuvers used in various grappling sports and in sports where blocking or tackling of the opponent is required. There is a large scale following of these sports among youth throughout the world. Wrestling and *Kabaddi* are among the most ancient and actively followed games in India. But, at the same time, these sports run a high risk of musculoskeletal injuries to any part of the body. Some of the injuries even prove to be catastrophic or fatal. The present article explores various fractures and dislocations which can occur due to these events according to modern parameters. The possible mechanisms that are involved in causation of such injuries have also been discussed.

Keywords: *Prabhriti*, *Sushruta Samhita*, *bhagna*, *Balvata Vighraha*, *Nibandha Samgraha*, Skeletal injuries, Grappling, Tackling

INTRODUCTION

Acharya Dalhana in his *Nibandha Samgraha* commentary on *Sushruta Samhita* has given the meaning of “*Prabhriti*” as “*balvata vighraha*” (fighting against a stronger person) and has considered it as one of the most frequent etiological factors of *bhagna* (skeletal injuries). Furthermore, the resultant injury can be of two types – *kandabhagna* (fracture) and *sandhimukta* (dislocation) ¹⁻³. The skeletal injuries with a similar mechanism in the modern times are associated with combative (grappling) sports such as wrestling, submission grappling, folk wrestling, professional wrestling and others. ⁴⁻⁷ Grappling involves a hand-to-hand combat which consists of gripping or seizing an opponent with an objective to take a physical advantage over him/her, usually by takedowns or ground control. ⁸ ‘*Mallayudha*’ is another modification of the same which is still practised in some parts of India. A fairly similar mechanism of injury is also encountered in the sports like American football, Rugby and *Kabaddi* where tackling/blocking of an opponent is essential that may result in compromised position of the body. ⁹⁻¹¹ These are among the most favoured adventurous sports which the young generation is attracted to. However, at the same time these are also associated with a number of traumatic injuries which may vary from mild to severe. ^{4,10,12} Rugby and wrestling particularly can cause severe catastrophic injuries. ^{13,14} Regardless of the risks involved in these sports, many teenagers and adolescents find them as their field of interest. This article reflects upon the association between fighting/blocking events and the common skeletal injuries caused by them. Analogically, this suggests that “*balvata vighraha*” (mentioned by *Dalhana*) is one of the most common etiological factors that engender traumatic skeletal injuries. The most common body parts which get injured during combats are the shoulder, elbow, hand, knee, ankle, foot, head, neck and back. ^{6,15-18} Injuries to arms, hips, thighs, chest and abdomen are relatively

less common during such fights. Although most of the injuries involve the soft tissue (sprains and strains), yet the incidences of skeletal injuries are also very common.

The possible mechanisms by which *balvata vighraha* causing various fractures have been discussed and compared using the modern parameters. Apparently, the mechanisms by which *bhagnas* were caused by *balvata vighraha* so many centuries ago still hold relevant within the framework of modern parameters for combative sports. This study stresses upon the importance of *Sushruta's* contribution and compares skeletal injuries in the context of *bhagna* mentioned in *Ayurvedic* treatises—the *Sushruta Samhita* (of *Sushruta*) and its *Nibandha Samgraha* commentary (of *Dalhana*).

Skeletal injuries due to *Balvata Vighraha*

The mechanisms by which grappling events between two individuals lead to injured body parts and respective skeletal injuries have been discussed in the following sections. The skeletal injuries sustained during such events can be due to direct or indirect mechanisms and inflicts almost the whole body. Most of the injuries in grappling sports occur during takedown manoeuvre when the athletes try to take each other down to the mat/ground from the standing position. The injuries mostly occur in the defensive athlete as he/she tries to protect himself/herself from falling down. ¹⁹ At the same time, the defensive athlete also experiences the maximal intensity of different forces and the speed of the move(s). Similarly, in sports like American football, rugby and *Kabaddi*, athletes take offensive positions during tackling or blocking which are responsible for increased forces. It is emphasized that the forces acting on a particular body part of the athlete at the time of injury would be even greater when the opponent is physically stronger (*Balvata*), regardless of their

weights. In the following sections, the various types of *bhagna* and related mechanisms due to *balvata vighraha* are summarised:

Skeletal injuries of Upper Extremity

Fractures and Dislocations of Hand and Fingers

Alex McDonald *et al* (2017) found that the hand and fingers were the most common sites of injury during the Brazilian jiu-jitsu (BJJ) training (a type of grappling sport). Consequently, the fractures and dislocations of phalanges are also commonly encountered in such fighting events. It is because the fingers of opponents remain in contact with each other for longer durations during grappling sports such as wrestling and BJJ. The finger may get bent or twisted when a player is trying to gain control over the opponent or it may be stuck in the opponent's clothes resulting in the phalangeal fractures and dislocations.⁶ The metacarpal fractures may occur as the athlete falls on an outstretched or dorsiflexed hand during fight. Metacarpal and phalangeal fractures are also found in American football players (mostly among the players in the defensive position) caused by player-to-player contact during tackling or blocking.²⁰⁻²²

Fractures and Dislocations of Shoulder

Trauma to the shoulder is also not infrequent following the wrestling, BJJ and judo events. Pasque *et al* (2000) while investigating high school wrestling events found the shoulder injuries to be the most common. Among 52 injuries, 7 wrestlers suffered with dislocation of the shoulder.²³ Alex Mc Donald *et al* (2017) also found 3 off 41 athletes who got their shoulders dislocated during BJJ training.⁶ Moreover, dislocation of the shoulder may also be complicated with injuries to the neurovascular structures around shoulder.^{24,25} Shoulder instability is one of the most common traumatic pathology in American football athletes. In this sport, the shoulders are abducted with the arms outstretched while blocking the opponent. This may cause the posterior instability of the joint.^{26,27} The other skeletal injuries of the shoulder region include the acromio-clavicular joint dislocation/subluxation, sterno-clavicular joint dislocation/subluxation and avulsion fractures of the scapula and lesser tuberosity.^{4,28} The acromio-clavicular dislocation occurs usually due to a fall on the shoulder.²⁹ The sterno-clavicular disruption may be caused during wrestling by direct violence when the opponent falls directly on a player or indirect violence when a serious force is applied to the shoulder.³⁰ The avulsion fracture of the inferior angle may occur due to resistive muscular contraction of the serratus anterior whilst the athlete is forced to mat with an arm-bar (shoulder in full extension with elbow locked in extension) position.³¹ While the arm is in external rotation and abduction, a strong external rotatory force may be the mechanism of injury in case of avulsion fracture of the lesser tuberosity of the humerus.³²

Fractures and Dislocations of Elbow

Scoggin *et al* (2014) and Kreiswirth *et al* (2014) found that injuries to the elbow were the most common in BJJ competition.^{18,33} The bony injuries at this site include the avulsion fractures of olecranon and medial epicondyle. The avulsion of medial epicondyle is reported in arm wrestling. The mechanism involves the shifting of pivot point on the table from olecranon to medial epicondyle, thus, causing its displacement. Alternatively, it may be avulsed following the external rotation of the distal humerus when a torque is produced between the internal rotators of the shoulder and the long lever arm of the opponent.^{34,35} The manoeuvres used in wrestling may cause sudden contraction of triceps resulting in the avulsion fracture of the olecranon.³⁶ The

dislocation of elbow may also occur occasionally following a fall on outstretched hand with flexed elbow during wrestling.^{4,37} The other fractures reported in an elbow injury following wrestling are supracondylar, pericondylar and radial head fractures. The mechanism involved was a fall on the extended arm.^{29,38}

Fractures of Forearm

Fractures of forearm have been documented in American football mostly among the athletes in defensive position. Tackling was the most common activity that resulted in such fractures.³⁹

Fractures of Wrist

According to Johnson *et al* (2017), the wrist bone fractures accounted for about 45% of all the injuries to the wrist in wrestling events among US High School athletes from 2005-06 to 2015-16.⁴⁰ The injury is also documented in BJJ.⁶ The majority of the injuries to the wrist leading to the carpal fractures occur as a result of forceful physical contact with the opponent or with the surface.^{29,40} Distal radius and scaphoid fractures have been reported in American football athletes while blocking or tackling in the field.²²

Fracture of Upper arm

The shaft of the humerus gets fractured commonly in the arm wrestling which is a popular mode of wrestling in India. The fracture is usually a spiral fracture at the junction of middle and distal one-third of humerus, with or without a butterfly fragment. The predominant force which causes humerus to break during arm wrestling is rotational, although there may be an axial load or bending component too.^{41,42} The possibility of such injury is greater when the opponent is stronger.

Skeletal injuries of Lower Extremity

Fractures and Dislocations of Foot and Toes

Injuries to the foot and toes were found to be the second most common injuries in BJJ training by Alex Mc Donald *et al* (2017). The bony injuries of toes may occur as the athletes are barefoot and the toes may be stuck in the floor mat. The dislocation of the inter-phalangeal joints usually occurs when the toe is caught in the mat during fight.⁶ Alternatively, the opponent may accidentally put his/her foot aggressively on an athlete's foot in order to gain balance following an unbalanced position. This may result in a metatarsal fracture by direct violence. The injuries like turf toe, Jones fracture, Lisfranc injuries in American football are attributed to the force on the distal extremity during tackling.^{6,43}

Fractures of Ankle

Fractures of ankle occur rarely in wrestlers. Alex Mc Donald (2017) reported only 2 cases of bony injury off the 30 wrestlers who sustained ankle injuries.⁶ The possible mechanism responsible is the contact with mat during takedown. In contrast, the deltoid complex avulsion injuries of the ankle are relatively common in the American football players and may occur during tackling.⁴³ Similarly, the ankle fractures are also found in rugby players which occur during tackling.¹⁰

Dislocation of Patella

The dislocation of patella may rarely be found during grappling events such as BJJ and wrestling.⁶ It may occur by a laterally directed blow when the opponent falls directly on the medial aspect of the knee.⁴⁴

Skeletal injuries of Torso

Fracture of Ribs

The ribs are one of the most common body parts to get injured during wrestling as these are always in the firing line during defense and other techniques. Akhmedov *et al* (2016) found that the incidence of rib injuries during Greco-Roman wrestling was 26% and in free-style wrestling was 15%.⁴⁵ Alex Mc Donald *et al* reported 6 cases of fractured ribs off the 27 injuries that occurred in the trunk during BJJ training.⁶ The athlete may directly fall on the ground or the opponent may sit on the chest of the athlete leading to rib fractures.²⁹ The ribs may also get injured during the takedown manoeuvres. The fractures of the ribs have also been found in American football which occurred due to direct blunt trauma during tackling.⁴⁶

Fracture of Clavicle

The fracture of clavicle is also a common skeletal injury encountered in American football and grappling sports like wrestling. The mechanism of injury can be a direct violence which occurs when the player falls on the tip of the shoulder (in wrestling) or when a player hits another player during tackling (in American football).^{30,47,48}

Skeletal injuries of Spine

The lumbar and the cervical spinal regions are more prone to injuries during grappling as compared to the other regions. The wrestler may fall directly on the back while fighting. This may cause vertebral fractures or inter-vertebral disc ruptures.^{6,19} The spines of many wrestlers had been found to be spondylolytic as a consequence of the back injuries.⁴⁹ The cervical spine injuries occur in wrestling as a result of axial compression to the top of the head when the wrestler's head strikes the ground and the neck is twisted. The resultant injury may be a fracture dislocation of C3-C4, C4-C5 or C6-C7. Moreover, it may cause paraplegia too.^{14,50,51} A cervical injury can also occur as a result of some head-holds during wrestling in which one arm is used to hold the head of the opponent.⁵² In Rugby, cervical injuries involving the fracture-dislocation of C4-C5 and C5-C6 are commonly encountered. The most common mechanism is the sustained hyperextension of the neck during scrummaging (a method of restarting play in rugby that involves players packing closely together with their heads down and attempting to gain possession of the ball).¹³

Skeletal injuries of Head and Face

The fractures of orbit, nasal bone and other cranial bones have also been found during wrestling. The mechanism may involve player-to-ground contact when the player's head strikes the ground or player-to-player contact, when the elbow or knee of one player hits the face of the other.^{4,29} Such injuries may also occur in American football which may be highly catastrophic and fatal.⁵³

CONCLUSION

The skeletal injuries occurring as a result of the grappling sports and the sports which involve blocking/tackling the opponents are quite common nowadays. The mechanism of these fractures and dislocations resemble those mentioned in *Ayurveda* many centuries back, i.e., "*Balvata vighraha*". The resultant injuries may occur due to direct or indirect violence. We concluded that whole of the body can be affected by this etiological factor. Such injuries can be prevented by understanding proper mechanisms.

Comparing the modern literature with *Sushruta's*, it is indicative that *Sushruta* has given due importance to every aspect of *bhagna* including its etiology although in a concise manner.

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