Rugby Injuries
A Review of Concepts and Current Literature

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Abstract

Rugby football continues to grow in popularity internationally and within the United States. In 1995, rugby union, one form of rugby, turned from amateur to professional throughout Europe, increasing the potential for monetary reward, which, in turn, secondary to higher levels of play, increased the risk of injury. With this increased higher interest and the increasing number of inexperienced and professional players in the U.S., there is a need for a comprehensive analysis of professional rugby union injury in the American literature and increased awareness of rugby injuries, in general, for all levels of players. This paper provides an in-depth analysis of professional rugby union injuries that will assist orthopaedic surgeons treating these injuries in the U.S. The data described highlights the potential impact of rugby injury in the U.S. and provides an overview of the international data to serve as the basis for future American studies. An additional goal of this review is to stimulate discussion regarding the necessity of implementing additional safety precautions for this high-risk sport. Finally, this analysis highlights the inconsistencies and discrepancies of the literature with respect to rugby union injury and the variability and weak interstudy reproducibility of current rugby injury data.

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Globally, rugby is the third most popular team contact sport. In America, rugby is growing at almost 25% a year, with approximately 250,000 active players. USA Rugby is the national governing body for the sport in the United States and is responsible for the organization of youth, high school, collegiate, club athletic programs, and, ultimately, the national teams representing the U.S. in international rugby union competition; they also serve as the sport's official representative to the U.S. Olympic Committee (USOC) and the International Rugby Board (IRB). (Personal communication, USA Rugby).

Rugby union (15 players a team) maintained amateur standing from the early 19th Century until 1995, when players acquired professional status throughout Europe. Given rugby's on-field competitiveness and its increasing international and national popularity, the sport has been associated recently with high levels of injury. Garraway and colleagues demonstrated this increase in injuries (for both professional and amateur players) on all levels and suggested that this rise in injury rate was secondary to an increased emphasis on speed, strength, and stamina. Game speed and the estimated injury incidence have approximately doubled over the last 40 years.[1] Rugby teams in the U.S. currently have amateur standing; however, with rugby union poised to turn professional in the U.S. within the next year or two, and with the anticipation of continued increases in rugby playing by both youth and adult athletes coupled with the observed higher injury rates, rugby injuries are likely to become more commonly seen by orthopaedic surgeons in the near future.

Despite approximately 96% of professional rugby union players reporting the use of some sort of protective equipment,[2] measures are typically limited to prophylactic strapping and taping, grease, support sleeves, shin guards, mouth guards, and soft-shelled helmets. This use of light-weight devices in rugby games was compared to the mandated use

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of heavier padding and hard-shelled helmets in American college football by Marshall and coworkers. They suggested that a lack of regulations mandating improved protective equipment in rugby, compared to American college football, is partially responsible for the three-fold higher injury rate in rugby.[3] However, one must also account for the difference in game structure between the two.

Materials and Methods

The vast majority of research on rugby injuries is confined to literature from the more prominent rugby playing nations, such as the United Kingdom, South Africa, Australia, and New Zealand. Injury rates have been studied at all playing levels, including junior,[2-5] amateur,[2,6,7] and international.[8-11] For purposes of this review, analysis of the orthopaedic literature was limited to a PubMed search for only prospective epidemiological studies focusing on professional rugby union injuries since 1995, to provide insight of the injuries encountered in today's professional game.

Injury Definition

Studies in the orthopaedic literature have differing definitions of what constitutes a rugby injury. For this review, a professional rugby injury was defined as: 1. an event that prevents a player from taking part in two subsequent training sessions or a single match[11]; 2. an event that requires a player to be removed from the field of play for the remainder of the game[10]; 3. an event that forces a player to leave the field of play, miss the next match, or both[8]; or 4. an event that causes lost time from training, competition, or both.[9]

Recent studies have all referenced the lack of a standard injury definition,[10-14] which results in a large discrepancy in the reported incidence of rugby injuries. In an attempt to formulate some interstudy comparison, various investigators have begun to utilize a standard approach when categorizing the severity of injuries.[9] Injuries have been classified as mild (less than 1 week absence), moderate (more than 1 to 3 weeks absence), or major (more than 3 weeks absence). Additionally, there have been attempts to standardize data collection in order to provide a more rigorous investigation of rugby injury epidemiology.[15] The IRB plans to document all professional injury data, beginning with the Rugby World Cup, in 2007, which may help to establish guidelines for documenting injury data in future studies.

Results

Despite numerous articles in the literature regarding rugby injuries, only four articles[8-11] met inclusion criteria for this review. Most injury rates are reported per 1000 player hours of exposure, allowing investigators to control for potential bias from differences in exposure by using an incidence density rather than a cumulative incidence measure. Targett followed 25 professional New Zealand players over a 6-month period and found an incidence of 120 injuries per 1000 player hours of game time.[11] Jakoet and Noakes described the statistics of 16 professional international teams during the 1995 Rugby World Cup and found an incidence of 32 injuries per 1000 player hours of exposure.[10] Bathgate and associates reported the incidence of the national Australian rugby team over 6 years and reported an incidence of 69 injuries per 1000 player hours of exposure.[8] Finally, Brooks and colleagues reported the rate of injury in the national English rugby team during their championship at the 2003 Rugby World Cup and reported a rate of 218 injuries per 1000 player hours of exposure.[9]

Table 1 Incidence of Injury as a Function of Injury Severity

	Targett[11]	Bathgate, et al.[8]	Brooks, et al.[9]
Mild	36 (71%)	91 (64%)	146 (82%)
Moderate	9 (18%)	20 (14%)	18 (10%)
Severe	6 (12%)	32 (22%)	14 (8%)

Brooks and coworkers suggested that this high incidence of 218 injuries per 1000 player hours of exposure was primarily due to a broader definition of injury.[9] They also reported other confounding biases that increased the injury incidence, such as players maintaining a higher body mass and being subjected to a 30% increase in time that the ball is in play, reported in the 2003 Rugby World Cup by the IRB.[9] Of interest, is that when the severity of an injury is taken into account, the discrepancy between injury rates disappears (Table 1).

Three of the four major studies reported the difference in number of injuries sustained during training versus in match play.[8,9,11] Brooks and associates were the only investigators to report an injury incidence during training and found that the incidence of injury during match play was 36 times as high than during training as well as being more severe (6.1 vs. 218 injuries per 1000 hours of exposure).[10] Similarly, Bathgate and colleagues and Targett reported that injuries sustained during training comprised 12% and 20% of all injuries, respectively.[8,11]

Since the onset of professional standing for rugby union players in 1995, there has been an increased incidence of rugby-associated injuries. Bathgate and coworkers' data demonstrated a nearly two-fold increase in injury incidence per 1000 player hours after the start of the professional era (47 vs. 74 injuries per 1000 player hours, respectively).[8] This is consistent with the hypotheses from Garraway and associates' series, which showed that the incidence of injury in senior-level Scottish players doubled after the onset of players playing professionally.[1] Reasons for this increase include the higher intensity of play, overtraining, and the ball being in play for longer periods of time.[1]

Mechanism of Injury

Rugby includes four main phases of play, the tackle, ruck and maul, set pieces (scrum and lineout), and open play. A tackle in rugby is the same as in American football, defined

Table 2 Reported Mechanisms of Injury During Rugby Union Matches

Injury Mechanism	Targett[11]	Jakoet, et al.[10]	Bathgate, et al.[8]	Brooks, et al.[9]
Tackle	46	56	58	36
Tackled	n/a	29	n/a	23
Tackling	n/a	27	n/a	13
Ruck/Maul	36	23	15	16
Set Piece	13	1	2	5
Scrum	7	1	2	n/a
Line out	5	0	0	n/a
Open Play	5	11	20	18
Running	n/a	n/a	n/a	10
Collision	n/a	n/a	n/a	8
Other	n/a	20	5	22
Kicking	n/a	n/a	n/a	1
Foul Play	n/a	9	4	n/a

as a player being brought to the ground by an opposing player. A ruck occurs when the ball is on the ground and players from the opposing team fight for possession. Mauls are characterized by a ball carrier being held by opposing players, with other players joining the tackle. Scrums occur after penalties and are an organized way for teams to form opposing tunnels. When the scrum is set to begin, the ball is placed in the created tunnel and the teams push each other in attempts to gain possession. Lineouts occur if the ball has left the field of play. Players are lifted in the air in order to attempt to catch the ball. Table 2 displays the most frequent mechanisms of injury. Regardless of the definition of injury, most injuries occur during a tackle (36% to 56%), with a player either being tackled or tackling.[8-11] Brooks and colleagues showed that the incidence of injury to the player being tackled is nearly twice that of the tackler (23 vs. 13%).[9] In terms of a player's position during a tackle, one-third of injuries occur when there is a differential in tackling speeds. The player with the lower momentum is injured four times as often as the player with the higher momentum in this scenario. In addition, half of all injuries sustained during tackles occurred during a blind tackle, that is, outside the peripheral vision of the player being tackled. When a player is tackled blind, the player who is doing the tackling usually sustains the injury.[11]

Discrepancy exists in the literature regarding the percentage of injuries occurring during open play and rucks or mauls. Rates are reported anywhere between 5% and 20% for open play and 15% to 36% for rucks or mauls.[8-13] However, these injury rates are far less than those reported during tackling.

In addition, the reported rates of injury due to foul play, which is defined as a player being penalized while causing an injury, represent 9% of all injuries sustained at the professional level.[10] Foul play consistently causes more injury than participation in set pieces. Even though set pieces do not comprise a great proportion of injuries (1% to 13%),[8-12] a retrospective study detailing debilitating injuries sustained to the cervical spine showed that they are generally related to the scrum or rucks.[16] The reported low incidence is likely due to the awareness of the risk of debilitating injury during this aspect of the game and the continual monitoring of scrum engagement by the referee. Studies at the school and club levels have also shown that the highest incidence of injury occurs during the tackle, followed by rucks, open play, and set pieces, respectively.[5-8] At times during a contest, when the players are organized into rucks and set pieces, players engaged with the opposing team will have their head down and arms abducted to varying degrees. However, there is an element of control during this aspect of play as opposed to the tackle, where the player's body may be in numerous, different positions. In addition, professional rugby players are assumed to have a greater knowledge of the techniques and skill necessary to prevent some of the most common injuries, while community athletes who are less skilled may be more prone to injury.[16-18.]

Positional Injury Rates

Injury rates vary with respect to position. Backs dominate the open running portion of the game, whereas forwards are more involved in the physical aspects of rugby, including set pieces, rucks, and mauls. Each position is highly specialized and requires an individualized training program, creating different physiological and anthropometric characteristics at each position.[19]

The New Zealand Rugby Injury and Performance Project demonstrated that players with greater body mass index (BMI) sustained a higher injury rate.[20] The investigators suggested that forwards should be more prone to injury than backs (Table 3). They also reported that midfield backs miss a significantly greater proportion of their season than their forward counterparts, due to the nature of high-speed tackles in the midfield.[20]

Studies evaluating rugby union prior to the onset of professional teams in Europe had suggested that the player positions of hookers (involved in multiple aspects of the game and responsible for keeping the ball moving forward, whether it be in open play or in a scrum, lineout, ruck, or

Table 3 Comparison of Professional Injury Rates (%) with Reference to Player Position

Player Type	Targett[11]	Jakoet, et al.[10]	Bathgate, et al.[8]	Brooks, et al.[9]
Forward	64	52	57	46
Back	36	48	43	54

Table 4 Types of Injuries Sustained at the Professional Level (%)

Injury Type	Targett[11]	Jakoet, et al.[10]	Bathgate, et al.[8]
Ligamentous	20	34	26
Laceration	12	27	23
Muscle / Tendon / Sprain / Tear	29	24	20
Fracture / Dislocation	4	11	14
Bruising / Hematoma	22	n/a	10
Concussion / Head Injury	10	3	5
Other	n/a	2 (hernia)	2

maul), wings (involved with finishing offensive attempts and subject to being tackled by the opposing fullbacks), fullbacks (a key defender involved in most tackling plays), centres (involved in breaking through the other team's front line), number 8s (have a role in both running with loose balls and acting as a battering ram during rucks), and flankers (responsible for clearing-up loose balls and beginning new phases of play) were at high risk for orthopaedic injury.[21] In contrast, Jakoet and Noakes found that loose forwards, half-backs, and locks suffered more injuries than backline players and fullbacks.[10] In addition, Bathgate and coworkers found that locks (usually the tallest members of the team responsible for jumping the highest during lineouts) and fly-halfs (usually the quickest players and known to make key decisions by altering the position of the ball during play) were injured the most frequently within the forwards and backs, respectively.[8] They cited the new role of locks in the professional game in open play as a cause for their recent increase in injury rate.[8] Targett reported that the loose forwards and fullbacks sustained the most injuries.[11] Thus, there seems to be no conclusive evidence to suggest which players hold the highest risk for injury.

A recent study by Best and associates during the 2003 Rugby World Cup confirms that open flankers, outside centers, and number 8s are the most commonly injured. In addition, they state that front line players sustain more head and neck injuries, secondary to the amount of forces sustained when engaged with the opposing team, while back line players sustain more shoulder and arm injuries.[12]

Types of Injury

A variety of injuries occur during rugby union play (Table 4), and the literature is somewhat consistent on the rates of each injury. Typically, soft tissue injuries account for more than 50% of all rugby-associated injuries,[8-11] including musculotendinous strains and tears, in addition to ligament sprains and tears, hematomas, and contusions. Targett found that the majority of injuries were muscular in nature.[11] Both Jakoet and Noakes and Bathgate and colleagues found similarly high rates of muscular injury; however, they found also higher rates of ligamentous injury and lacerations.[8,10] Brooks and coworkers as well found that the majority of injuries (87%) involved muscles, ligaments, or joints.[9]

Injury Site

Lower Limb

Current literature suggests that the lower limb is the most commonly injured anatomical region across all experience levels, accounting for approximately 42% to 55% of all injuries sustained in rugby.[8,10] Musculotendinous and ligament strains and tears, hematomas, and contusions of the lower extremity are seen frequently in these athletes.[8-11] Forwards and backs sustain the greatest amount of thigh contusions, but anterior cruciate ligament (ACL) injuries in forwards and hamstring injuries in players who were backs were responsible for the majority of missed days.[22]

To give an indication of where injuries occur in the lower limb(s), Bathgate and associates further subdivided their data associated with the lower limb into hip (2%), thigh (19%), knee (20%), lower leg (6%), ankle (11%) and foot (3.5%) injuries.[8] Additionally, training injuries to the lower extremities are common, accounting for an overall incidence of 2 in 1000 player-hours, which results in an average of 24 absent days.[23,24] Players with training injuries may attempt to return to play earlier than is recommended, which might contribute to a higher rate of injury during match play.[25]

In terms of knee pathology, early studies determined that rugby union had a high rate of ACL injury. Even though ACL tears may not be as common as once thought, they were reported by Brooks and colleagues to be the most severe injury, leading to a mean of 235 in missed days.[9] Meniscal pathology was the second most severe injury, resulting in an average of 155 missed days.

Posterior cruciate ligament (PCL) injuries have been infrequently reported in current rugby literature. Toritsuka and coworkers reported on 16 acute isolated PCL injuries treated conservatively. Despite between a 1 to 7-months time to return, 14 of the patients were able to return to their

preinjury level of play with conservative treatment. The most noticeably affected skill was high speed running.[26]

As ankle inversion sprains are common in rugby, recent literature has focused on external support in injury prevention. Prospective data has shown that external support provides some level of protection against ankle injury without having a detrimental effect on performance.[20]

Upper Limb

Professional rugby union literature suggests that the upper limb accounts for 13% to 19% of all injuries. Injuries to the upper extremity include those similar to the lower limb, including lacerations, contusions, sprains, dislocations, and fractures, as well as rotator cuff tears and glenohumeral instability. Bathgate and associates, Brooks and colleagues, and Targett all report that upper extremity injuries are often severe.[8,9,11] Brooks and coworkers reported that the average severity, based on days missed from playing, was 16, similar to that seen with injuries to the lower limb.[9] This is likely due to the inclusion of rotator cuff tears and shoulder impingement that carried a severity of 71 days on average, offsetting the particularly severe ACL and meniscal pathology. The upper extremity injuries sustained by forwards were much more severe than those sustained by backs; 21 versus 7 days, respectively.[9] Bathgate and associates' study also showed that the hand, finger, and shoulder sustained disproportionately more severe injuries.[8] They reported that 80% of the severe injuries to the hand were fractures, including Bennett's fractures, metacarpal fractures, and fracture dislocations of the PIP joint. In addition, 80% of the severe injuries to the shoulder were dislocations that all required open shoulder surgery for stabilization and rotator cuff repair.[8] There is no evidence to suggest that the use of shoulder pads decreases the incidence of severe shoulder injury; however, these pads can reduce soft tissue damage to the protected areas.[27,28]

Prior to the onset of professional teams, almost 45% of elite rugby union players reported a history of acromioclavicular (AC) joint injury, all of whom continued to play at the highest level.[29] Interestingly, in the current professional literature, there is little mention of AC joint pathology.[8-11] There may still be a high incidence, but that incidence may be under-reported secondary to its lack of association with impingement.[29] Cardone and colleagues reported on a cohort of 14 professional players who sustained grade III AC injuries, eight of whom were treated surgically.[30] In this limited study, the results showed a trend toward a faster return and satisfactory outcome in the surgical group.[30] Elbow injury rates were also low, reported to account for less than 1% of injuries in the current prospective literature.[8-11]

Trunk

Injuries to the trunk comprise 4% to 11% of all professional rugby union injuries, the majority of which tend to be less severe than injuries to other areas.[8-11] Brooks and coworkers reported an average severity of only 6 days for trunk injuries.[9] Wekesa and associates prospectively studied injury rates of an international rugby tournament prior to the 1993 Rugby World Cup and reported a higher percentage of trunk injury compared to recent studies.[31] However, their results were inflated due to very small reference numbers.

Head and Neck

Injuries to the head and neck account for 14% to 29% of all injuries.[8-11] There appears to be no difference in head injury incidence between backs and forwards; however, the severity is typically greater in forwards. Overall, head and neck injuries are consistently less severe in terms of subsequent days missed than those in the upper and lower limbs.[10,31]

The major difference in the reported injury rates to the head is, again, due to the multiple definitions of injury.[32] Facial lacerations that required the player to leave the field of play accounted for 12% to 19% of all injuries, according to Targett and Bathgate and colleagues.[8,11] However, Brooks and coworkers found that facial lacerations accounted for less than 1% of all injuries in their study.[9]

As with other contact sports, rugby is associated with a high potential for concussions. The rate of concussion may still be underestimated in the literature, as many players suffer minor head injuries and decide to not leave the field of play, and their treatment, if any, may not be referred to team physicians. Thus, these players do not meet the full definition of injury and are not reported in the literature.[8] Marshall and Spencer observed two high school rugby teams following rugby union rules for 3 years and reported that concussions accounted for 25% of all injuries, which is significantly higher than the 3% and 5% incidence reported in other studies.[33] They attributed this increased incidence to under-reporting in previous studies by players who were suspended if they sustained a concussion.

There has been recent discussion over the use of protective headgear in rugby union. Gerrard and associates reported that players in New Zealand who wear protective headgear are typically forwards who are recovering from injury or who had been concussed several times in the past.[34] Furthermore, a recent Canadian review of the literature shows that there is conflicting evidence as to whether headgear can actually prevent concussion and that both players and coaches have differing beliefs on their protective value.[35,36] Studies are currently being conducted regarding the use and benefit of headgear on injury prevention.[37]

Mouth guards have been used in the prevention of orofacial and dental injury.[38] Historically, injuries to the teeth, mouth, jaw, and neck were considered common,[39] but in today's game mouth guards can protect against such injuries.[40] In 2003, 64% of French rugby union players reported using mouth guards during play.[40] The majority of recent studies have shown that most orofacial and dental injuries are sustained in players not wearing mouth guards.[40]

Facial fracture and temporomandibular joint injury account for a minimal proportion of head and neck injuries. However, these injuries can be used to outline the high incidence of injury sustained during foul play. The New Zealand Rugby Injury and Performance Project reports that foul play is generally localized to the head, causing laceration (65%), concussion (17%), and fracture (9%).[34] These injuries are typically sustained by forwards through blows encountered in rucks and mauls.[41]

The eye also has been found to be particularly susceptible during foul play. Although uncommon while playing rugby, punching and eye gouging can cause serious injury to the eye, including retinal tears. In addition, blunt trauma to the ears by the opposing team during mauls can cause acute intra-auricular hematomas.[42] With foul play generating such a significant proportion of all rugby union injuries, it is apparent that this illegal aspect of the game should be addressed by the IRB in order to prevent injury.

Spine

The prospective studies examined in this review do not differentiate spinal injuries as a separate category due to their relative infrequency. However, spinal injury is of great concern, secondary to their increasing incidence since the 1970s and 1980s. Much of the current literature focuses on case studies, and tracking incidence has been difficult due to the lack of properly conducted prospective epidemiological studies. Similar to the introduction of mouth guards for the protection of orofacial injury, prior research conducted on the consequences of spinal injury has led the IRB to implement alterations to the laws of the game, as well as to focus increased attention on the education of safe techniques.[43]

Rugby cervical spinal cord injury is usually the result of extreme neck flexion, with or without rotation or hyperextension of the C4, C5, and C6 vertebrae. This mechanism generally occurs during the scrum, in which a front-row player can have forces of up to 1.5 tons (approximately, 3300 lbs) exerted on their flexed cervical spine when engaged with the opposing team. This force often exceeds that which is required to cause compression failure of the vertebral body (4500 N) or ligamentous injury to the cervical spine (2000 N).[44] Hooker players suffer approximately 30% of these injuries.[43] Since the 1990s, however, Quarrie and colleagues have shown an increasing proportion of spinal cord injuries occur during the tackle.[45] Such injuries are sustained early within the season, likely secondary to players lacking practice and physical conditioning.

Front line players experience the greatest amount of cervical spine trauma. Berge and coworkers reported on the age-related changes in the cervical spine of these athletes.[46] These players showed a greater amount of degenerative alteration on magnetic resonance imaging (MRI) scans than did control subjects. It was hypothesized by the investigators that repetitive trauma may be linked to these findings.[46] Whether headgear can prevent these changes has yet to be determined.

Discussion

It has been well documented that a meta-analysis of the current professional rugby union injury data is not possible. There are numerous references in the literature describing a clear lack of a shared method of data collection and lack of a single definition of injury. Without a consensus on how to gather data and define injury, subsequent studies with additional methodologies can only confuse interpretation of the already sparse data available. This review was undertaken to provide a current look into and an analysis of the overriding themes and conclusions reported in the literature and to provide a sense of the types of injuries sustained by professional rugby players, though increased awareness of higher and more serious injury frequency to amateur players should be part of our community of thought as well.

From the available data, the evolution of the anthropometry of the player, positional role changes, enhanced speed, and intensity of the game have all contributed to the increase in injury incidence at the professional level. As part of the current game, protective equipment rarely involves anything more than prophylactic strapping, grease, support sleeves, shin guards, and soft-shelled helmets. This is in stark contrast to the extensive protection apparatus used by American football players, who carry a three-fold lower incidence of injury. It appears that with such high injury rates, there is a need for improved protection of rugby players. American football and rugby football share remarkably similar game objectives and physical actions, such as the forward advancement of the ball against an defending opponent. However, the vastly different rules of play in addition to the difference in gear shifts the vulnerability for and incidence of injury, while shaping both the skill sets of players and the fan experience of each sport. By looking at their similarities and dissimilarities, we can be better informed to anticipate and train to avoid as well as treat actual injuries in both sports.

Rugby injuries vary at each position with respect to severity, mechanism, type, and site. Further study is needed to fully appreciate these intricate differences, although the data available provides enough information to underscore several overlying themes. Injuries are rarely found during the set piece. This is thought to be due to the heightened awareness of the risk of debilitating spinal injuries by referees who now ensure correct engagement of the scrum and correct positioning for line outs during play. The more uncontrolled aspects of the game have been found to cause a greater risk of injury, especially during the tackle. Additionally, the high rates of injury during foul play should qualify for further monitoring by the referees to ensure that this aspect of the game is kept to a minimum.

Even though rugby players sustain a high number of concussions and serious head and neck injuries, the overwhelming majority of injuries are limited to musculotendinous and

ligamentous complexes in the upper and lower extremities. Such injuries have been associated with greater severity as levels of play are increasing. For example, ACL and rotator cuff tears often require reconstructive surgery and long recovery periods that force players to miss a large amount of playing time.

Conclusion

To fully comprehend and utilize the available professional rugby injury data, additional research will require a more detailed data collection method that can be broken into previously used classification systems, and U.S. physicians will need to familiarize themselves with vulnerabilities and injuries related to positions of the game. Only in this manner will cross-study validation and the full understanding of the epidemiology of rugby injury be possible. This paper highlights the numerous potential injuries encountered in an increasingly popular sport. Physicians should be aware of these injuries when taking care of and counseling patients participating in rugby.

Rugby is a competitive, complex sport involving numerous and different aspects of play. Injuries occur frequently during both practice and match play. Secondary to the various phases of the game, forces experienced by players, and lack of protection, the potential for injury increases in comparison to other sports that may not be as complex or involve as high impact forces. The tackling phase during rugby is considered the phase most commonly associated with injury, secondary to the forces dissipated when one player makes contact with an opponent.

In terms of players and player position, BMI correlates with higher injury rate, which is consistent with higher forces that can occur during contact with the opposing players. Additionally, players involved in open field play experience more injuries, consistent with their involvement in the tackling phase of the game.

Soft tissue damage is the most frequently reported injury in rugby. Additionally, the lower limb(s) has a higher rate of injury, with the thigh being the most common area injured. Both upper and lower extremity injuries resulted in, on average, 16 days of missed play. The trunk, spine, and head are also reported as common sites of injury, secondary to the magnitude of forces experienced by these athletes.

With the growing popularity of rugby in the U.S. and the potential for rugby to become a professional sport, physicians will be faced with treating these athletes. Familiarity with the common injuries that these patients present is critical for successful treatment algorithms.

Finally, despite the difficulty in data collection in regard to rugby injuries, this paper serves to raise awareness of the increased numbers of injuries in an emerging sport across a range of youth and adult players. As is common among other sports, nonprofessional players may be at increased risk of injury because of improper technique and less offseason and pregame training. Thus, by studying common patterns in professional rugby athletes, physicians will be better trained to advise patients regarding the potential for injury and to provide alternative methods of training to avoid time missed.

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