Upper Extremity Injuries in the National Football League: Part II: Elbow, Forearm, and Wrist Injuries

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Upper Extremity Injuries in the National Football League

Part II: Elbow, Forearm, and Wrist Injuries

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Background: Very little information is available regarding the incidence, causative mechanisms, and expected duration of time lost following upper extremity injuries in professional American football players.

Hypotheses: (1) Upper extremity injuries in professional American football players are a common cause of missed time from practice and game participation. (2) The effect of upper extremity injuries differs as a function of the site involved and the athlete's position.

Study Design: Descriptive epidemiologic study.

Methods: A retrospective review of all documented injuries to the elbow, forearm, and wrist sustained by all players in the National Football League over a 10-year period (1996-2005) was performed using the League's injury surveillance database. An injury was considered significant if it resulted in premature cessation of (or absence from) at least 1 practice, game, or training event. The data were analyzed from multiple perspectives, with emphasis on the type of injury, athlete position, and activity at the time of injury.

Results: There were 859 total injuries over the 10-year period: 58% involved the elbow, 30% involved the wrist, and 12% involved the forearm. Ligamentous injuries were the most common diagnosis in the elbow and wrist, with wrist sprains the most common of all diagnoses. Fractures were the most common injury occurring in the forearm. For all 3 anatomic locations, game injuries were much more common than practice injuries by a factor of 2.8 to 1. Forearm injuries led to a mean of 42 days lost, wrist injuries led to a mean of 27 days lost, and elbow injuries led to an average of 22 days lost. Fractures and dislocations led to the greatest amount of time lost (47 days and 53 days, respectively). Tackling was the activity most often (24%) implicated as causing injuries to the elbow, forearm, and wrist. Offensive and defensive linemen were most commonly injured. Elbow injuries were the most common at these positions, constituting approximately 75% of all injuries. Defensive backs sustained the greatest number of forearm injuries, approximately double the total number at any other position.

Conclusion: Upper extremity trauma is a significant issue for professional football players. In particular, the high incidence rates of elbow injuries in linemen and forearm injuries in defensive backs warrant further scrutiny.

Keywords: American football; National Football League; upper extremity; injury

Multiple epidemiologic studies have documented the incidence and anatomic distribution of American football injuries in the young adult population.[1,3,5,8,16] It has been estimated that between 600 000 and 1.2 million football-related injuries occur annually in the United States.[2,20] Injuries that are likely to effect the longevity of an athlete's career or injuries that limit the ability of an athlete to perform at a maximal level have been the focus of previous investigations.[6,7,10,12,15,19,22,23] For example, considerable attention has been given to the epidemiology and treatment of concussions,[15] anterior cruciate ligament (ACL) injuries,[6] and foot and ankle conditions such as hyperextension of the first metatarsophalangeal joint ("turf toe").[19] Despite the deleterious effects of these injuries on the ability of an athlete to compete, a recent study of musculoskeletal disorders detected during routine screening at the National Football League (NFL) Invitational Camp (also known as the NFL Scouting Combine) has shown that upper extremity injuries,

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taken as a whole, are more common than concussions, turf toe injuries, and ACL tears.[7]

It has been estimated that approximately 30% of football injuries at all levels of play involve the upper extremities.[10] Unfortunately, many of the existing studies on upper extremity injuries in football players are outdated, deal solely with amateur athletes, and may not reflect the true incidence (or effect) of injury in the professional athlete.[4,13,17] As such, it is unclear whether the patterns, locations, and associated risk factors for upper extremity injuries that have been described for high school and collegiate football players are similar to the injuries currently seen in NFL players. In addition, the same injury sustained by players of differing positions may have drastically different outcomes in regard to treatment and timing of return to play. Our hypotheses were that (1) upper extremity injuries in professional American football players are a common cause of missed time from practice and game participation, and (2) the effect of upper extremity injuries differs as a function of the site involved and the athlete's position. The purpose of this study was to review the epidemiology of forearm, elbow, and wrist injuries that have been reported over a 10-year period in the NFL with an emphasis on incidence and time lost from play.

MATERIALS AND METHODS

A retrospective review of all documented injuries to the elbow, forearm, and wrist was performed using the NFL Sports Injury Monitoring System (Flantech Group, Cottonwood, Arizona). In this system, an injury was considered significant and reportable if it resulted in premature cessation of at least 1 practice, game, or training event. Additionally, football injuries that were treated in a delayed fashion, even if not associated with premature cessation of play, were also reported. The number of games and practices were given to us from the number recorded from the injury database. All exposures were routinely recorded by each team and entered in the database. The nature of the database and the mode of data acquisition are described in detail in Part I: Hand and Digital Injuries (in this issue).

For the purposes of this study, the elbow was defined as the articulation between the distal humerus, proximal radius, or proximal ulna, including the surrounding soft tissue envelope. The wrist was defined as the set of bony articulations between the distal radius, distal ulna, and carpus, along with the interosseous ligaments and cartilaginous structures between these bones. The forearm was considered the intervening portion of the radius and ulna (and soft tissue envelope) between the elbow and wrist.

Injuries were classified into 8 groups by the authors: general trauma (eg, contusion, laceration, and puncture), inflammatory/overuse disorders (eg, bursitis, tendinitis, capsulitis, epicondylitis, and tenosynovitis), infection/cellulitis, muscle-tendon injuries (eg, strain, tendon avulsion, and tendon subluxation), fracture (including fracture-dislocations), ligamentous injury/joint instability (eg, sprains, dislocation, or subluxation without associated fracture), isolated cartilaginous injury (eg, loose bodies, osteochondritis, chondromalacia, and nonspecific joint degeneration), and miscellaneous (ie, nonspecific joint injury, elbow calcification, joint impingement, and nerve disorders).

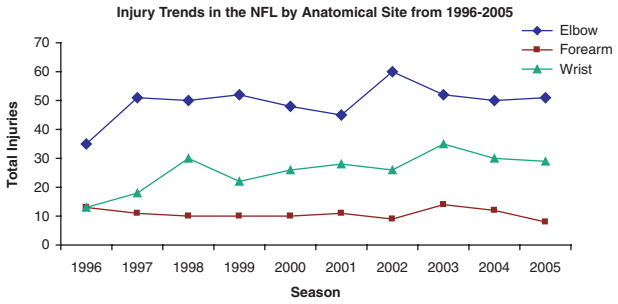

Figure 1. Injury trends in the National Football League by anatomic site, 1996-2005.

RESULTS

Total Injuries by Location

Over the 10-year surveillance period, there were a total of 24 432 reported injuries affecting all parts of the body (including systemic "injuries" that did not involve an extremity, such as heat-related illnesses). Of this total, 859 injuries involved the elbow, forearm, and wrist, representing 4% of reported injuries or illnesses. Of these 859 upper extremity injuries, 494 (58%) involved the elbow, 108 (12%) involved the forearm, and 257 (30%) involved the wrist. There were a total of 2 304 184 athlete exposures during the 10 seasons studied, resulting in an overall rate of 10.6 total injuries per 1000 athlete exposures. The incidence of injury per 1000 athletic exposures within the areas of surveillance was 0.21 for elbow injuries, 0.05 for forearm injuries, and 0.11 for wrist injuries. Both wrist and elbow injuries had a general upward trend in total number of diagnoses over the 10-year period of study, while forearm injuries remained relatively constant over the same time period (Figure 1).

Injury Type

In general, ligamentous/joint instability injuries were the most common diagnosis in the elbow and wrist, representing 51% and 72% of the injuries to these 2 joints, respectively. Fractures were the most common injury of the forearm and the second most common injury to the wrist, comprising 78% and 17% of the total injuries to these 2 anatomic areas, respectively. Figure 2 details the number of injuries in each category for the elbow, forearm, and wrist.

Table 1 summarizes the 20 most common diagnoses reported. Of the ligamentous/joint instability injuries, wrist sprains (as an isolated diagnosis) were the most common, accounting for 160 (37%) of the 436 injuries in this category. However, when all elbow sprains were

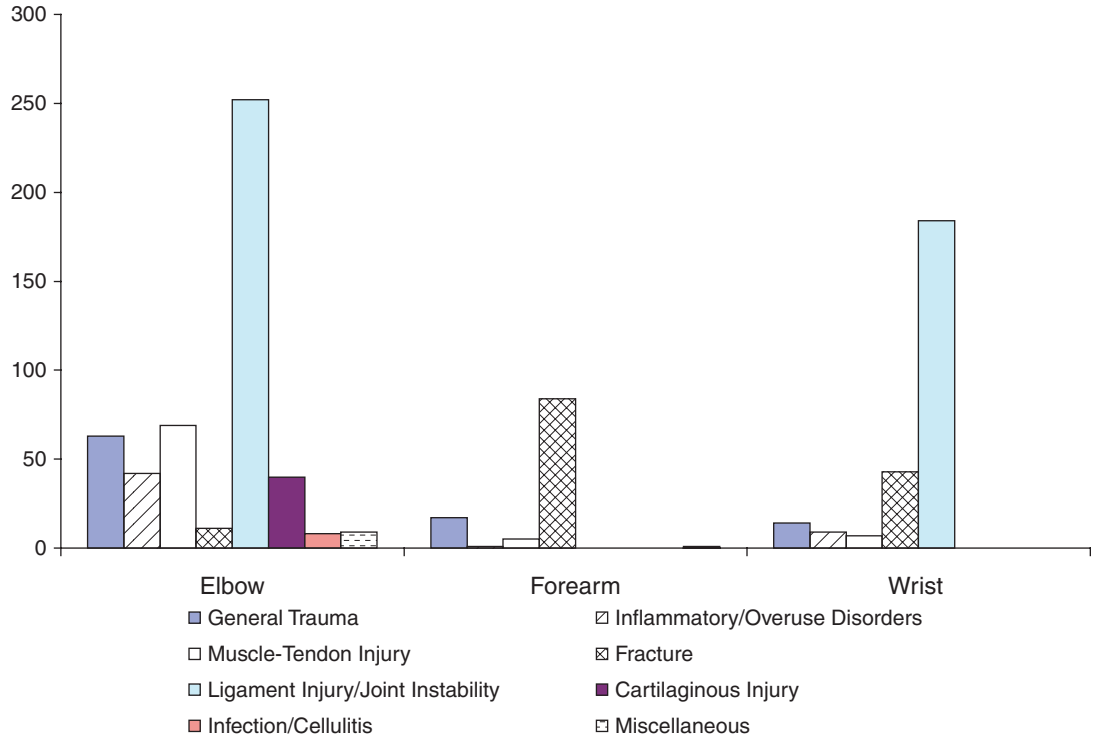

Figure 2. Categories of elbow, forearm, and wrist injuries in the National Football League, 1996-2005.

TABLE 1
Twenty Most Frequent Injuries Reported

Rank	Diagnosis	No. of Reported Injuries	Frequency of Injury for All Diagnoses Combined (%)
1	Wrist sprain	160	19
2	Elbow hyperextension sprain	114	13
3	Forearm fracture	84	10
4	Medial/lateral elbow sprain	65	8
5	Elbow contusion	56	6
6	Elbow dislocation/subluxation	44	5
7	Wrist fracture	43	5
8	Triceps strain/avulsion	38	4
9	Elbow loose body formation	36	4
10	Wrist dislocation/subluxation	24	3
11	Elbow inflammation/epicondylitis	22	2
12	Olecranon bursitis	16	2
13	Forearm contusion/laceration/abrasion	16	2
14	Wrist contusion/puncture	15	2
15	Biceps strain/tendon avulsion	15	2
16	Elbow fracture	11	1
17	Wrist synovitis/tendinitis	9	1
18	Nonspecific elbow strain	8	<1
19	Elbow hyperextension strain	6	<1
20	Forearm muscle strain	5	<1

grouped together as a whole (not including biceps and triceps sprains), the resulting total (179 injuries, representing 41% of the injuries in the category) eclipsed that of wrist sprains. Nevertheless, the 160 wrist sprains represented 62% of all injuries to the wrist and 19% of the total number of injuries to the elbow, forearm, and wrist combined. Elbow hyperextension injuries were the second most commonly reported injury (as an isolated diagnosis), accounting for 24% of all elbow injuries and 14% of all injuries to the elbow, forearm, and wrist combined.

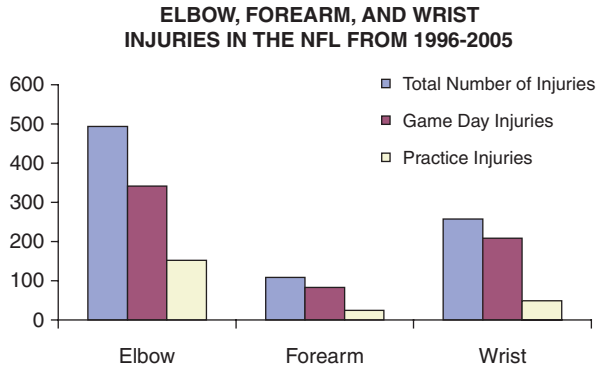

Figure 3. Elbow, forearm, and wrist injuries (game versus practice) in the National Football League, 1996-2005.

Game Versus Practice Injuries

For all 3 anatomic locations, game injuries were much more common than practice injuries (Figure 3), with 633 (74%) of the total injuries occurring in games and 226 (26%) occurring in practice. There were a total of 1 976 524 practice exposures and 327 660 game exposures over the 10-year period studied, resulting in an incidence of injury to the anatomic locations studied of 1.93 per 1000 athlete exposures during games and 0.11 per 1000 athlete exposures during practice. Of the 494 elbow injuries, 342 (69%) occurred during games and 152 (31%) occurred during practice. Likewise, of the 108 forearm injuries, 83 (77%) were game injuries and 25 (23%) were practice injuries. Of the 257 wrist injuries, 208 (81%) occurred during games and 49 (19%) occurred during practice sessions. Despite the fact that substantially more time is spent practicing than playing (thus increasing the potential injury exposure time during practice), there was an almost 17-fold increase in the risk of injury during games in comparison to practice.

Days Lost from Play

The 494 elbow injuries resulted in 10 858 total days lost, for a mean of 22 days lost per injury (range, 1-340 days). The 108 forearm injuries resulted in 4506 total days lost, with a mean of 42 days lost per injury (range, 0-114 days). For the 257 wrist injuries, 6824 total days were lost, with a mean of 27 days lost per injury (range, 0-260 days).

Injuries categorized as general trauma led to the quickest recoveries on average, with a mean of 6 days lost per injury. Inflammatory/overuse disorders led to the next fastest return to play, with an average of 10 days lost per injury. Within this group, wrist inflammation was particularly limiting, with an average of 28 days lost per event. Ligamentous/joint instability injuries, as the most common overall category of injury, led to the greatest total number of days lost (8057), with a mean of 18 days lost to injury. However, fractures (mean of 47 days lost) and dislocations (56 days lost) led to the greatest amount of time lost on average. Table 2 summarizes the total number of injuries for each anatomic location and the average time lost for each of the 8 injury categories.

Injury Mechanism

The majority of injuries occurred while players were either actively engaged in tackling or blocking (24% and 23% of injuries, respectively). Noncontact activities and those activities due to an unidentifiable cause were reported the least (2%). The elbow was the most commonly injured area for all activities, with 53% of all tackling injuries and 63% of all blocking injuries occurring at the elbow. The act of being tackled and the act of being blocked also led to a high percentage of elbow injuries (with 52% and 67% of injuries secondary to those mechanisms occurring in the elbow, respectively). A complete breakdown of player activity and frequency of injury for each anatomic location is shown in Table 3.

Injury by Position

Offensive and defensive linemen (representing the largest conglomerate position groups on all teams) sustained injuries to the areas of surveillance most commonly, with 20% of the total number of injuries affecting each position group, respectively. The elbow was the most common site of injury for players of all positions, except wide receivers (who

TABLE 2
Types of Injuries by Anatomic Region With Number of Days Lost

	Number of Injuries				Mean Number of Days Lost			
Injury Category	Elbow	Forearm	Wrist	Total	Elbow	Forearm	Wrist	Total
General trauma	63	16	15	94	6	4	5	6
Inflammatory/overuse disorder	42	1	9	52	7	13	28	10
Infection/cellulitis	8	0	0	8	6	0	0	6
Muscle-tendon injury	69	5	7	81	66	7	22	58
Fracture	11	84	43	138	28	52	42	47
Ligamentous/joint instability	252	0	184	436	14	0	25	18
Cartilage injury	40	0	0	40	40	0	0	40
Miscellaneous	9	1	0	10	18	3	0	17

TABLE 3
Injuries for Each Anatomic Region as a Function of Football Activity

Anatomic Region		Activity							
		Tackling	Tackled	Blocking	Blocked	Other contact	No Contact	Other	Unknown
Elbow	Number	111	54	126	53	35	15	89	11
	% Within body part	22%	11%	26%	11%	7%	3%	18%	2%
Forearm	Number	50	15	13	4	15	4	6	1
	% Within body part	46%	14%	12%	4%	14%	4%	5%	1%
Wrist	Number	47	35	61	22	38	1	45	8
	% Within body part	18%	14%	24%	8%	15%	1%	17%	3%
Total	Total	208	104	200	79	88	20	140	20
	% Within body part	24%	12%	23%	9%	10%	2%	16%	2%

TABLE 4
Incidence of Injuries as a Function of Roster Position

Roster Position		Position[a]									
		QB	RB	WR	SEC	LB	Off Line	Def Line	TE	Spec	Other
Elbow	Number	36	27	27	37	45	132	129	17	31	13
	% Within body part	7%	5%	5%	7%	9%	27%	26%	3%	6%	3%
Forearm	Number	5	9	4	35	16	7	7	3	18	4
	% Within body part	5%	8%	4%	32%	15%	6%	6%	3%	17%	4%
Wrist	Number	8	26	34	31	34	34	38	16	24	12
	% Within body part	3%	10%	13%	12%	13%	13%	15%	6%	9%	5%
Total	Number	49	62	65	103	95	173	174	36	73	29
	% Within body part	6%	7%	8%	12%	11%	20%	20%	4%	8%	3%

[a]QB, quarterback; RB, running back; WR, wide receiver; SEC, defensive secondary; LB, linebacker; Off Line, offensive lineman; Def Line, defensive lineman; TE, tight end; Spec, special teams.

had a greater number of wrist injuries), constituting 76% of all injuries to offensive linemen and 74% of all injuries to defensive linemen. Tight ends were least likely to sustain any injury to the elbow, forearm, or wrist as only 4% of the total number of injuries affected players of this position. Quarterbacks also constituted a small percentage (6%) of the total number of elbow, forearm, and wrist injuries. However, of the 49 documented injuries to quarterbacks, 36 (73%) occurred at the elbow. Running backs and wide receivers had a similar number of total injuries (62 and 65, respectively), with wrist injuries most common (10% and 13%, respectively). Players in the so-called defensive secondary position (composed of cornerbacks and safeties) sustained the greatest number of forearm injuries (with 35 reported), representing 34% of all injuries of this type. This was almost twice as much as the percentage of forearm injuries contributed by any other position. Injuries to the elbow, forearm, and wrist were fairly equally distributed in this group, with 37, 35, and 31 injuries occurring at each site, respectively; only the forearm injuries were notably higher than expected. Table 4 includes a complete summary of the number of injuries occurring to the elbow, forearm, and wrist for all roster positions.

Injuries that occurred to players participating in "special teams" activities were analyzed as a separate position category despite the fact that these players usually had other primary positions (except kickers and punters). Of the 859 injuries to the elbow, forearm, and wrist, 73 (9%) involved players on special teams. Of these 73 injuries, 19 (26%) occurred in players having a primary position in the defensive secondary (safeties and cornerbacks). Linebackers were the next most commonly injured players, with 10 reported injuries (representing 14% of all special teams injuries). Collectively, most special teams injuries involved the elbow—31 total injuries, constituting 42% of injuries at this position. Eighteen forearm injuries were documented (25% of all injuries at this position), a total that was second only to defensive backs in terms of frequency of forearm injury.

DISCUSSION

Injury prevention is ultimately dependent upon the recognition of common injuries, with subsequent identification of the underlying mechanisms and associated risk factors for that injury. Typically, this understanding is sport-specific. A thorough epidemiologic assessment of sport-specific trauma is critical to allow identification of commonplace diagnoses and the players at greatest risk of exposure. Implementation of such a process ultimately has the positive

effect of stimulating rule changes, equipment modifications, and training regimens that may reduce the absolute number of injuries and help to decrease the overall risk of injury. Although this study, like others of its kind, is limited by the fact that it is a retrospective review of prospectively collected data, considerable information can still be garnered from such results, which can serve as a steppingstone for future research that could potentially reduce injury rates over the long term. An example of the benefits that can extend from related research on player safety is the dramatic reduction in the number of catastrophic head and neck injuries sustained by football players after 1976, when rule changes were implemented that outlawed spear tackling at the high school and collegiate level.[22,23]

Very few studies have focused on upper extremity trauma in professional athletes.[11,12] Mair et al[14] performed a retrospective review of 11 partial and 10 complete triceps tendon tears in professional football players occurring over a 6-year period in the NFL from 1991 to 1996. The focus of their study was on MRI diagnosis of injury and on player outcomes following surgical and nonoperative treatment. Although this information was not available as part of our study, it is interesting to note that the number of complete triceps tears that occurred in the 10-year period of our study was only 10 (with an additional 28 triceps strains of varying degree noted). Mair et al[14] commented on the known relationship between anabolic steroid use and atypical tendon injuries, such as triceps tears. As the NFL initiated its steroid screening program in 1990, it is unclear if the decreased overall rate of complete triceps tendon rupture noted in our study is a continued reflection of the increasingly strict enforcement of this policy.

Kenter et al[12] performed a retrospective review of injuries to the elbow over a 5-year period in the NFL. However, the focus of their study was primarily on medial and lateral collateral ligament injuries, not a comprehensive review of all injuries to this joint. These authors documented 91 total elbow injuries in the NFL from 1991 to 1996 (with 28 teams represented from 1991 to 1994, and 30 teams from 1994 to 1996). This resulted in an average of 18 injuries per year, with 77% of those injuries being defined as "sprains." Despite the fact that the data for our study were generated from the same NFL database, elbow injuries in the NFL from 1996 to 2005 were noted to occur at a much higher rate, with 49 injuries occurring each year, on average. This represents an approximately 2.7-fold increase in elbow injuries over a relatively short period of time. The increase in the total number of injuries can, in part, be attributed to changes in the methodology of injury reporting, as well as to the greater number of teams in our study. Kenter et al[12] included only sprains, dislocations/subluxations, fractures, and a single "miscellaneous" injury in their study, whereas our study noted an additional 116 injuries in the categories of general trauma, infection/cellulitis, inflammatory disorders, and cartilage injury. However, even after eliminating these additional injury types, there remains a comparative twofold increase in the number of documented elbow injuries in our study. Additionally, the average number of elbow sprains per year was noted to increase in our study (from 12 to 28), as was the average number of fractures per year (0.67 to 1.1).

This upward trend in the incidence of injury in professional athletes has been previously noted by Brophy et al[7] in their review of injuries at the NFL Combine. They found that almost all diagnoses increased in total number from 1987 to 2000, excluding a group of 7 injuries (with carpal fractures being the only diagnosis included in this group from the anatomic regions surveyed in our study). Although their data did not find elbow injuries to be one of the 12 diagnoses with the greatest increase in frequency, our study—when compared to the number of injuries noted by Kenter et al[12] from 1991 to 1996—certainly supports an increasing trend of elbow injury in professional football players. Although the addition of expansion teams during our study period undoubtedly accounts for at least a part of the increase in total number of injuries, this fact alone is likely not responsible for the comparative increase in elbow trauma that we detected. For instance, from 1996 to 1997, there was a 1.5-fold increase in the incidence of elbow injuries per 1000 athlete exposures despite the fact that these were nonexpansion years. Other possible explanations include rule changes instituted during this time period, a change in strategic emphasis (ie, increased passing), change in blocking or tackling techniques, or potential sampling error due to underreporting of injuries to other anatomic structures. Brophy et al[7] attributed most of the apparent increase in the frequency of injuries to detection bias. Specifically, as clinician examination skills continue to improve and as imaging studies become more specific, more potential injuries are being identified. Additionally, as our treatment measures become more sophisticated, more players are able to return to play, potentially creating a pool of individuals who are at greater risk of reinjury. Regardless of the actual cause, the trend of increasing elbow injuries noted in our study is certainly worthy of further evaluation, as elbow injuries were shown to be more common than wrist and forearm injuries for all offensive and defensive skill positions except for wide receivers. Fortunately, players appear to return to play at a faster rate following an elbow injury (22 mean days lost) compared to forearm (42 mean days lost) and wrist injuries (27 mean days lost).

Forearm injuries, while less common than injuries to the elbow and wrist, are also an area of concern, as the vast majority (78%) in our analysis were fractures. In fact, forearm fractures were the third most common injury to the upper extremity. This is of particular concern as these injuries will lead to a significant amount of time lost from football and typically will require surgery. Players in the defensive secondary are at particular risk for injury to the forearm, having sustained 2.2 times the number of forearm injuries compared to other players who do not participate in special teams and 1.9 times the number of forearm injuries compared with players who play on special teams. This is likely due to the nature of activity (such as tackling at a high rate of speed) performed by these players, although players on special teams (kick and punt coverage and return squads) also engage in tackling after generating considerable speed while running down the field. This theory is also supported by our finding that approximately

46% of forearm injuries occurred during the act of tackling—an activity that is performed both during normal positional play as well as during kickoff and punt coverage—which is more than 3 times the incidence of injury noted from any other mechanism. To our knowledge, there are currently no studies in the literature focusing on forearm injuries in the professional athlete, much less in the professional football player.

Other than an isolated case study[21] and a single-team report on injuries of the hand and wrist,[9] there has only been a single previous study in the literature specifically dedicated to the evaluation of wrist injuries in football players.[18] Raab et al[18] reviewed 10 lunate and perilunate dislocations that that occurred over a 5-year period in the NFL. They found that, while carpal dislocations were not career-ending, all players missed at least 4 weeks of play (excluding a single player who returned to play in 1.5 weeks, developed an infection, and had additional time loss for surgical treatment of that complication). Specific data on the actual amount of time lost from play were not provided, with time of return to first practice following the injury listed variably as 1.5 weeks to "next season." Our study found a similar prevalence of wrist dislocation, with 22 carpal dislocations documented over the 10-year period. We also found similar recovery periods, with players missing between 38 and 130 days, on average, due to carpal dislocations. It is likely that such a wide range was related to conservative versus surgical treatment. Unfortunately, the actual treatment rendered for the players in our study was not available.

Far more common than dislocations of the wrist, however, were wrist sprains. Over the 10-year study period, wrist sprains (as an isolated diagnosis) represented the most common injury to the elbow, forearm, and wrist (although elbow sprains, when grouped together, were actually slightly more common). Brophy et al[7] found that wrist and hand injuries, other than fractures, were the second most common injuries reported at the NFL Scouting Combine over a 14-year period, with defensive players being affected more often than offensive players. Although there is no clear predilection for wrist injuries based on player position in our study, quarterbacks were noted to contribute the lowest overall percentage of wrist injuries (3%). Clearly, this may be related to the fact that only 1 quarterback is on the field at any one time, or to the fact that these players typically attempt avoidance of contact. Accordingly, the number of injuries to this group of players would be expected to be low. In any case, no clear causative mechanism could be identified for the number of wrist injuries in our study, as all 4 of the primary modes of injury contributed, with blocking being the most commonly reported. Although this does not help to isolate individual players who are most in need of additional wrist protection, it does emphasize a general need for improved wrist injury prevention strategies in players at most positions.

There are several limitations of this investigation related to the data collection process. First, there is no way to standardize diagnoses and decisions on return to play, as multiple trainers and physicians were involved in these determinations for all 32 teams. Second, the database does not include information on treatments rendered for each injury, or the effect of those treatments on an athlete's return to play (both in the short term, and in relation to the timing of an injury/treatment to eventual player retirement). Third, the same injury that occurs early in training camp may have a different prognosis for return to play than one that occurs at midseason, or beyond, due to a team's willingness to place a player on "injured reserve" (which negates his return to play that season). This information was not available. However, given the large number of injuries collected, the total period of surveillance, and the number of players involved, it is unlikely that this issue changes the results of our study in a significant way.

Although the design of the current monitoring system did not allow for such analysis, further information could be obtained if player position and activity at the time of injury were linked directly to each specific diagnosis. This would give a better understanding of the highest risk activities for each position, and the injuries that are likely to result when players engage in these activities. In this way, risk prevention strategies could also be more easily developed. Additional focus should also be given to the specific interplay between player position and injury treatment, as different injuries clearly affect different players in different ways. Other issues that demand further consideration include the effect of age, previous injuries, and hand dominance on specific diagnoses. Player position on the depth chart and playing surface also likely influence the types of injuries seen in the NFL. Information on the relationship between time of year (preseason versus regular season versus playoffs) and the time lost from injury would also be of interest.

This study is unique in that it is the first of its kind to provide a comprehensive breakdown of upper extremity injuries for the NFL based on mechanism and player position, and to report the effect of these injuries on timing of return to play. In particular, the high rates of elbow injury in linemen and the elevated incidence of forearm fracture in defensive backs warrant further scrutiny. It is our hope that this epidemiologic study will be a steppingstone for future studies and injury prevention strategies that address these commonly occurring injuries.

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