

Incidence and Variance of Foot and Ankle Injuries in Elite College Football Players

Lee D. Kaplan, MD, Patrick W. Jost, MD, Nicholas Honkamp, MD, John Norwig, ATC, Robin West, MD, and James P. Bradley, MD

Abstract

We conducted a study on the risk for foot and ankle injuries in college football players on the basis of injury type and player position. In February 2006, we evaluated 320 intercollegiate football players at the National Football League Combine. All pathologic conditions and surgical procedures of the foot and ankle were recorded, and data were analyzed by player position to detect any trends.

Seventy-two percent ($n = 231$) of the players had a history of foot and ankle injuries, with a total of 287 foot and ankle injuries (1.24 injuries/player

injured). The most common injuries were lateral ankle sprain ($n = 115$), syndesmotic sprain (50), metatarsophalangeal dislocation/turf toe (36), and fibular fracture (25). Foot and ankle injuries were most common in kickers/punters (100% incidence), special teams (100%), running backs (83%), wide receivers (83%), and offensive linemen (80%). Lateral ankle

studied with respect to many variables, few studies have evaluated player position-specific trends concerning these injuries. Torg and Quederfeld¹⁴ analyzed knee and ankle injuries with a focus on athletic shoes and cleats, and Tyler and colleagues¹⁵ reported that players with previous ankle sprains and high body mass indi-

“Various studies have reported that linemen are at highest risk for knee injury.”

Dr. Kaplan was Assistant Professor of Orthopedic Surgery, Department of Orthopedics and Rehabilitation, University of Wisconsin, Madison, Wisconsin. He is now Chief, Division of Sports Medicine, and Faculty, Miller School of Medicine, University of Miami, Miami, Florida.

Dr. Jost was Medical Student, University of Wisconsin, Madison, Wisconsin. He is now Resident, Hospital for Special Surgery, New York, New York.

Dr. Honkamp was Fellow, Department of Sports Medicine, University of Pittsburgh, Pittsburgh, Pennsylvania. He is now Member, Des Moines Orthopaedic Surgeons, Des Moines, Iowa.

Mr. Norwig is Head Athletic Trainer, Pittsburgh Steelers, Pittsburgh, Pennsylvania.

Dr. West is Assistant Professor of Orthopedic Surgery, and Dr. Bradley is Clinical Associate Professor, Department of Sports Medicine, University of Pittsburgh, Pittsburgh, Pennsylvania.

Address correspondence to: Patrick W. Jost, MD, Hospital for Special Surgery, 535 E 70th St, New York, NY 10021 (tel, 212-606-7376; fax, 212-606-1477; e-mail, jostp@hss.edu).

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sprains, the most common injuries, were treated surgically only 2.6% of the time. Offensive linemen were most likely to have had syndesmotic sprains (32%), and quarterbacks had the highest incidence of fibular fractures (16%).

Foot and ankle injuries are common in collegiate football players, affecting 72% of players. Thirteen percent underwent surgical treatment. Trends are seen in the types of injuries for the different player positions.

An estimated 11% to 81% of participants in American football sustain an injury at some time while playing the sport.^{1,2} Numerous studies have evaluated the injury rates of players in youth football to college and professional football.³⁻⁸ Foot and ankle injuries, along with knee and hand injuries, are consistently among the most common types of musculoskeletal injury.³⁻¹³

Although foot and ankle injuries are quite common and have been

ces were more at risk for sustaining another ankle sprain. In a study of injury rates by position over a 14-year period, Brophy and colleagues¹⁶ found that ankle sprains were consistently the most common injuries and that the incidence of ankle sprains increased over the study period. Various studies have reported that linemen are at highest risk for knee injury.^{5,9,14,15,17,18} Turbeville and colleagues,¹⁹ in a study of high school players, found linemen to be at highest risk for knee injury and season-ending injury. However, other studies have found running backs to have the highest risk for overall injury. Canale and colleagues³ reported that fullbacks have the highest statistical risk for overall injury. Evaluating high school football players in California, Ramirez and colleagues²⁰ documented running backfielders—a

Table I. Incidence of Foot and Ankle Injuries and Surgeries by Player Position

Position	Players (n)	Players With Injury		Players With Surgery	
		n	%	n	%
Running back	29	24	82.8	7	24.1
Wide receiver	40	33	82.5	5	12.5
Offensive lineman	50	40	80.0	7	14.0
Defensive back	59	41	69.5	2	3.4
Defensive lineman	54	37	68.5	6	11.1
Linebacker	36	24	66.7	4	11.1
Tight end	21	13	61.9	4	19.0
Quarterback	25	13	52.0	3	12.0
Kicker/punter	4	4	100.0	1	25.0
Special teams	2	2	100.0	1	50.0
Total	320	231	72.2	40	12.5

category that includes wide receivers, cornerbacks, defensive backs, safeties, running backs, and fullbacks—as having a higher risk for injury when compared with linemen. Culpepper and Niemann⁴ asserted that players who handle the ball are the most likely to be injured, with quarterbacks having the highest percentage of injuries in their study. To our knowledge, no study has assessed the relationship between a player's position and his risk for sustaining a foot or ankle injury.

We conducted this study to determine the incidence of foot and ankle injuries in elite collegiate American football players and the relationship to player position. The hypothesis was that foot and ankle injuries in American football players would be related to player position.

METHODS

The University of Wisconsin institutional review board and the National Football League (NFL) Health and Safety Committee provided approval for this study. The study was conducted during the 2006 NFL Combine in Indianapolis, Indiana, where elite college football players with potential professional ability were evaluated by various NFL teams and their respective medical staffs over a 4-day period. The data necessary for this study were collected during each athlete's medical evaluation.

Three hundred twenty elite college football players were invited

to participate in the 2006 Combine. All players attended voluntarily and provided written consent to be evaluated. Each player provided a thorough medical history and underwent a complete physical examination by NFL team orthopedic surgeons, with specific detailing on previous injuries, treatment, and current status. Medical history was obtained from the records of the player's college training staff, professional team scouts, and the player's own report. The previous medical and surgical records and previous and current imaging studies were analyzed during the medical evaluation.

Drs. Kaplan and Bradley obtained histories of foot and ankle injuries from each player, either directly or from the team. This was followed by a discussion of mechanism of injury with the player and a directed physical examination to independently verify the diagnosis.

For the purpose of this study, all athletes with a history of foot and ankle injury or surgery were identified during the medical evaluation. The information collected included player position, injury type, and all surgical procedures performed. Player positions were defensive back, defensive lineman, linebacker, offensive lineman, kicker/punter, quarterback, running back, tight end, wide receiver, and special teams. Radiographic features and physical findings (range of motion, strength, stability, etc.) were used to confirm and further define injury

patterns when necessary. Estimated loss of playing time and nonoperative treatment protocols were not collected.

The association between foot and ankle injuries (or procedures) and player position was assessed with χ^2 tests. Only injuries and diagnoses that had at least 10 observations were considered. When a difference was found at a significance level of 5%, the individual cell contribution to the χ^2 statistic was computed, and a value exceeding 2.5 was noted as a possible source for the significance. All computations and figures were done in R for Windows (version 2.1.0, patched 2005-04-18).

RESULTS

Three hundred twenty elite college football players (165 offensive players, 149 defensive players, 6 placekickers and specialists) were evaluated at the 2006 NFL Combine. Defensive backs ($n = 59$), defensive linemen (54), offensive linemen (50), and wide receivers (40) had the largest number of athletes per position evaluated and comprised 63% of the athletes at the Combine (Table I). A history of a foot and ankle injury sustained while playing football was reported by 231 players (72%). They had a total of 287 foot and ankle injuries (1.24 injuries/player injured). Of these players, 102 (44%) were defensive players, 123 (53%) were offensive players, and 6 (3%) were placekickers or specialists (Table I).

Table II. Summary of Injuries and Surgeries

Injury	Players (n)	Total Injuries	% of Players	Players With Surgery (n)	Total Surgeries (n)	Surgery Rate (%)
Lateral ankle sprain	100	115	31.3	3	3	2.6
Syndesmotic sprain	47	50	14.7	0	0	0.0
MTP dislocation/turf toe	35	36	10.9	4	4	11.1
Fibular fracture	24	25	7.3	11	12	48.0
Jones fracture	17	17	5.3	10	10	58.8
Lisfranc sprain	11	12	3.4	0	0	0.0
Medial ankle sprain	7	7	2.2	1	1	14.3

Abbreviation: MTP, metatarsophalangeal.

Table III. Common Foot and Ankle Injuries by Player Position

Injury	Player Position										Total
	DL	DB	K/P	LB	OL	QB	RB	ST	TE	WR	
Players (n)	54	59	4	36	50	25	29	2	21	40	320
Players with surgery (n)	6	2	1	4	7	3	7	1	4	5	40
Lateral ankle sprain	18	20	3	12	10	5	7	1	7	17	100
Syndesmotic sprain	9	9	0	5	16	1	3	1	2	1	47
MTP dislocation/turf toe	4	5	0	5	5	3	5	0	3	5	35
Fibular fracture	3	3	0	3	3	4	4	0	2	2	24
Jones fracture	5	1	1	1	5	1	0	1	1	1	17
Lisfranc sprain	2	1	0	1	3	0	2	0	1	1	11
Medial ankle sprain	0	0	0	0	3	0	3	0	1	0	7

Abbreviations: DB, defensive back; DL, defensive lineman; K/P, kicker/punter; LB, linebacker; MTP, metatarsophalangeal; OL, offensive lineman; QB, quarterback; RB, running back; ST, special teams; TE, tight end; WR, wide receiver.

Table II lists the most common foot and ankle injuries: lateral ankle sprain (100 players, 115 injuries), syndesmotic sprain (47 players, 50 injuries), metatarsophalangeal (MTP) dislocation/turf toe (35 players, 36 injuries), and fibular fracture (24 players, 25 injuries). Players often fell into 2 or more of these groups, having sustained separate injuries. Kickers/punters (100%), special teams (100%), running backs (83%), wide receivers (83%), and offensive linemen (80%) sustained the highest incidence of foot and ankle injuries, quarterbacks (52%) and tight ends (62%) the lowest (Table I).

Lateral ankle sprains were by far the most common injury, affecting 31% of players, including 17 (43%) of the 40 wide receivers (Table III). A history of a syndesmotic injury was documented in 47 (15%) of all 320 players. Syndesmotic sprains were most common in specialists (1/2, 50%), offensive linemen (16/50, 32%), and defensive

linemen (9/54, 17%), with statistical significance found for offensive linemen as compared with the other positions. MTP dislocation/turf toe injuries were also common, affecting 35 of 320 players (11%). These injuries were seen most often in running backs (5/29, 17%), tight ends (3/21, 14%), and linebackers (5/36, 14%). Quarterbacks sustained more fibular fractures (16%) than other players did.

Overall, 40 players (26 offensive players, 12 defensive players, 1 placekicker, 1 specialist) underwent 46 surgeries (Table I). Specialists (1/2, 50%), placekickers (1/4, 25%), and running backs (7/29, 24%) had the highest percentage of players with a history of foot or ankle surgery, though the first 2 groups were small in number. Only the percentage of running backs who had undergone surgery (24%) was significantly higher than that of other players ($\chi^2 = 3.1$). Defensive backs had the lowest percentage of players with a history of foot or ankle surgery (3.4%, $\chi^2 = 3.9$).

The most common surgery was open reduction and internal fixation (ORIF) of a fractured ankle, comprising 26% of the surgical procedures. The 12 players who had undergone ankle ORIF included 3 linebackers and 3 running backs. Ten players, including 3 offensive linemen, had undergone ORIF of a Jones fracture.

DISCUSSION

Foot and ankle injuries are common in collegiate football players. Annual incidence has ranged from 9% to 39% in epidemiologic studies,^{4-8,10,11} but, in the present study, 72% of players presented to the 2006 NFL Combine with a history of foot or ankle injury. The foot and ankle are highly susceptible to injury in football players with increasing exposure and may be at higher risk as opponents become stronger and more skilled.

Another study by our group demonstrated that a history of previous shoulder injury was a risk factor for

repeated injury (mean, 1.3 shoulder injuries/player injured).⁹ In a subsequent study by our group, recurrent knee injuries were also common (mean, 1.3 injuries/player injured).²¹ In the present study, we found a similar rate: 1.24 injuries to the foot and ankle per player injured. Brophy and colleagues¹⁶ found ankle sprains to be the most common injury for any anatomical site in 6 of 9 of the player positions and the second most com-

undergone surgery for foot or ankle injury repair (24%, 7/29) may indicate that these athletes sustain more severe injuries than other players do.

Although running backs were more likely to have sustained a lateral ankle sprain, offensive linemen presented with a higher percentage of syndesmotic ankle sprains. This trend may be related to the mechanism of injury; running backs engage in more open-

position or specific activity. Also, this study provides only a snapshot of accumulated injuries during a single Combine. It also is possible that some of the injuries may have occurred outside football-related activities. Our sample size is relatively small, which could prevent trends in injury patterns from reaching significance. This is a particular problem in positions with only a few players, such as kickers and punters, at the Combine.

“The higher risk to the foot and ankle in the ‘skill positions’ may be related to the increased cutting and direction changes required by these players.”

mon injury in 2 other positions. This finding is consistent with ours: Ankle sprains were by far the most common foot and ankle injuries. Our results also support the findings by Turbeville and colleagues¹⁹ that previous injury is a risk factor for more injury. The ability to predict and prevent recurrent injuries is important not only to maximize playing time but to prevent future degenerative joint disease. Moretz and colleagues²² found a significantly higher rate of knee osteoarthritis in athletes who sustained a knee injury during high school football 20 years earlier.

Foot and ankle injuries occurred more often in offensive players, with running backs, wide receivers, and offensive linemen all reporting high incidence. Canale and colleagues³ also found running backs, fullbacks in particular, to be the most prone to overall injury, though other studies have found that injuries were most likely in linemen.^{5,9,17,19,20} The higher risk to the foot and ankle in the “skill positions” may be related to the increased cutting and direction changes required by these players and to the increased risk for a twisting injury during tackling. The significantly higher percentage of running backs who have

field cutting maneuvers and are required to change direction at high speeds, which may lead to inversion of the ankle. Lateral ankle sprains often are caused by an inversion mechanism, consistent with our findings. Linemen are more often involved in pile-ups that lead to blows to the leg with a planted foot, leading to internal rotation of the body around a fixed, dorsiflexed foot. Syndesmotic sprains are thought to be caused by external rotation and/or hyperdorsiflexion, again consistent with our findings.²³

At the Combine, quarterbacks had the lowest percentage of players with previous foot or ankle injury (52%, 13/25). This lower rate may be related to lack of contact with opposing players in a significant percentage of plays.

Study Limitations. Our study has important limitations. It was designed to identify associations between player position and injury type. Information on the type of play, playing conditions, and time lost for each injury was not collected. In addition, data on injuries sustained during special teams play were not analyzed independently. This information could be valuable to understanding the associations of the injuries with player

Elite college players whose injuries were severe enough to prevent them from progressing to the level of the Combine automatically were excluded from this study, likely causing us to underestimate both injury incidence and injury severity. Our data collection method allows for significant recall bias. Much of the information used in this study was provided directly by the athletes, which raises concerns that players may minimize the effects or severity of their injuries for fear that they may reduce their value as a professional football player. Every effort was made to obtain a thorough medical history and perform a complete physical examination and to correlate these with any available imaging studies to minimize this effect as much as possible, but it cannot be completely eliminated.

CONCLUSIONS

This study shows that foot and ankle injuries are very common in elite collegiate American football players, affecting 72% of the players in our study group. However, most injuries did not lead to surgery. Our data illustrate the influence of player position on type of foot and ankle injuries sustained and may be used to try to anticipate and avoid these injuries.

AUTHORS' DISCLOSURE STATEMENT

The authors report no actual or potential conflict of interest in relation to this article.

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