



Increased Incidence of Thumb Injuries in Intercollegiate Men's Lacrosse

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Abstract

The purpose of this study was to compare the relative incidence of thumb injuries in men's lacrosse with similar intercollegiate stick-handling sports. In this descriptive, epidemiological study, NCAA Injury Surveillance System data was gathered pertaining to hand injuries in gloved, stick-handling sports (men's ice hockey, men's lacrosse, and women's lacrosse). Data analysis was performed to determine the relative exposure of the thumb with respect to total hand injuries. During 16 intercollegiate seasons, there were 692 thumb, finger, and hand injuries in 3,038,255 athletic exposures. Total thumb injuries were significantly increased in men's lacrosse, accounting for 59.4% of total hand injuries when compared to women's lacrosse (42%) and ice hockey (35.8%) ($p < 0.001$). Thumb fractures and contusions were each also found to be significantly increased ($p < 0.001$) when compared to women's lacrosse and ice hockey. Injury rates of the thumb are significantly elevated in men's intercollegiate lacrosse. Recommendations include development of gloves with improved thumb protection.

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Background

Lacrosse is an extremely popular men's sport. At the intercollegiate level, it is a competition that combines speed, power, and extremely hard impact objects. These objects include "crosses", with plastic heads and wood, composite or hollow metal shafts, the solid rubber ball, the opponents, and goal cages. Due to body checking, as well as legal checking of either the crosse head or shaft with the opponent's crosse, there is extensive potential for injury to the upper extremity. As in other contact stick-handling sports, such as men's ice hockey and women's lacrosse, protective gloves are worn in an effort to minimize injury rates.¹⁻³ This study was conducted to evaluate the injury rates of various intercollegiate stick-handling sports in order to determine whether the intercollegiate men's lacrosse player is at increased risk for certain injuries.

Materials and Methods

Data Collection

The NCAA Injury Surveillance System (ISS)⁴ was utilized from 1986 – 2002 to analyze thumb, finger, and hand injuries in stick handling sports. These sports included men's ice hockey, men's lacrosse, and women's lacrosse. Women's ice hockey was not included because ISS data collection for this sport was only initiated in the 2000-2001 academic year. The NCAA Injury Surveillance System is a database that accumulates annual injury data from Division I, II, and III collegiate institutions designed to monitor injury trends in intercollegiate athletics. As a surveillance system, rather than a registry that would measure every single injury, the ISS collects sample data from a larger population and has maintained stable basic system definitions and recording methods to provide a general foundation of

Sport	Average # of Participating ^b Schools	Average # of Sponsoring ^c Schools	% of Total Schools Participating	% of Participating Schools		
				D I	D II	D III
MLAX	33	183	18.0	30.3	12.1	57.6
WLAX	42	180	23.3	38.1	7.1	54.8
MIH	31	127	26.0	45.2	6.5	48.4

Table 1. School Participation in ISS Reporting Among Each Sport ^{6,12,13}
 a. MLAX = men’s lacrosse, WLAX = women’s lacrosse, MIH = men’s ice hockey
 b. “Participating” refers to schools that provided appropriate data to the NCAA Injury Surveillance System
 c. “Sponsoring” refers to the total number of schools offering the sport within the NCAA divisions
 d. D-I, D-II, and D-III refers to NCAA Divisions I, II and III, respectively

collegiate athletic injury risk across many sports. As such, it is regarded by many as a resource unmatched anywhere in the sports medicine

literature. ⁵ Participation in Injury Surveillance System reporting among the different sports is reported in Table 1.

A reportable injury was defined as one that occurs as a result of participation in an organized intercollegiate game or practice, required medical attention by the team athletic trainer or physician, and resulted in the restriction of the student athlete’s athletic participation for one or more days beyond the date of injury. A separate injury report was generated by the athletic trainer for each injury. Each injury was described in detail, including the type of injury, body part injured, mechanism of injury, field condition, playing surface, and type of exposure (practice versus game). Types of reported injuries include fracture, laceration, contusion, and ligamentous sprain.

Statistical Analysis

Descriptive statistics performed included calculation of frequency of injury per 1000 athletic exposures. Differences in proportion of injuries among men’s lacrosse, women’s lacrosse, and men’s ice hockey were analyzed using χ^2 test with Yates’ correction for continuity, and a p-value of 0.05 was used to denote statistical significance. Odds ratios and 95% confidence intervals were calculated to compare relative likelihood of injury to the thumb between men’s lacrosse and both women’s lacrosse and men’s ice hockey. Statistical calculations were performed using Stata 8.0 (College Station, TX).

Each week the athletic trainer also submitted a form documenting the number of athletic exposures, defined as one athlete participating in one practice or game, where that athlete was exposed to the possibility of athletic injury. Data aggregation was performed at the end of each season by the NCAA. Injury rates are expressed as the number of injuries per 1000 athletic exposures in each compared category. The ISS does not report every single exposure or injury, rather, it provides a representation of intercollegiate play that should accurately reflect injury patterns and rates across NCAA competition. NCAA ISS data are reported prospectively and are publicly available via the Internet.⁴ For this reason, and because there are no personal identifying parameters reported, this investigation was deemed to be IRB exempt.

Results

During the period from 1986 to 2002, injuries to the thumb, fingers, and metacarpals, as well as exposures, were collected for three intercollegiate stick-handling sports, men’s and women’s lacrosse and men’s ice hockey. In this period of time, 692 injuries in 3,038,255 exposures were documented among the three sports (Table 2).

Sport ^a	Exposures ^b	Total Injuries ^c	Rate ^d	Thumb Injuries ^c	Rate ^d	% of Total Injuries Involving Thumb
MLAX	1019222	276	0.27	164	0.16	59.4%
WLAX	686488	75	0.11	32	0.05	42.7%
MIH	1332545	341	0.26	122	0.09	35.8%

Table 2. Rates of Hand and Phalangeal Injuries – 16 Years of NCAA ISS Data

- a. MLAX = men’s lacrosse, WLAX = women’s lacrosse, MIH = ice hockey
- b. Exposure defined as one athlete participating in one practice or game, where that athlete was exposed to the possibility of athletic injury
- c. Injury defined as one that occurs as a result of participation in an organized intercollegiate game or practice, required medical attention by the team athletic trainer or physician, and resulted in the restriction of the student athlete’s athletic participation for one or more days beyond the date of injury
- d. Rate is reported per 1000 exposures, calculated as (# injuries) / (# exposures) * 1000

Of 276 thumb injuries sustained in men’s lacrosse, there were 135 fractures, 60 contusions, 47 ligamentous injuries, 14 dislocations, 10 lacerations, and 10 other/type not reported. One hundred and forty-five (52.5%) were the result of a contact with an opponent’s stick, 49 contact with ball, 41 contact with another player, 30 contact with ground or artificial surface, and 11 other/not reported. With regard to part of the hand involved, there were 164 thumb, 56 phalanx, and 56 metacarpal injuries.

Total rates of injuries of the thumb, fingers, and metacarpals were found to be significantly higher in the men’s lacrosse (0.27/1000) and men’s ice hockey (0.26/1000) when compared with women’s lacrosse (0.11/1000). Individual rates of thumb injuries were significantly higher in men’s lacrosse players (0.16/1000) compared to rates in omen’s lacrosse players (0.09/1000) (p<0.001) and men’s ice hockey players (0.05/1000) (p<0.001) (Table 2). Injuries to the thumb in particular were statistically significantly increased for men’s lacrosse (59.4%) compared with either men’s ice hockey (35.8%) or women’s lacrosse

(42.7%) (Figure 1). The odds of sustaining a thumb injury in men’s lacrosse was 3.45 times greater than in women’s lacrosse and 1.76 times greater than in men’s ice hockey (Table 3)

Specific injury patterns were found more commonly to involve the thumb in men’s lacrosse players. When broken down by part injured, fractures of the hand involved the thumb 56% of the time in men’s lacrosse compared to 48% in women’s lacrosse and only 27% of the time in men’s ice hockey (p<0.001). Thumb contusions were also significantly increased in men's lacrosse (61.7%) compared to women's lacrosse (33%) and ice hockey (27%) (p<0.001).

Discussion

Injury patterns in men’s lacrosse have been a subject of increasing interest as participation continues to grow.^{6,7} While the overall incidence of hand injury appears to be low, injury to the hand/thumb in the lacrosse player can be a source of extensive morbidity. In a high school population of boy’s lacrosse players, fractures of the “hand and wrist” were the fourth most common injury type but second

	Odds Ratio	95% CI ^b	p-value
MLAX^a vs. WLAX^a	3.45	2.37, 5.03	<0.001
MLAX vs. MIH^a	1.76	1.39, 2.22	<0.001

Table 3. Statistical Analysis Comparing Rates of Thumb Injury Among Stick-Handling Sports

- a. MLAX = men’s lacrosse; WLAX = women’s lacrosse; MIH = men’s ice hockey;
- b. CI = confidence interval

only to ligamentous knee injuries in terms of median days of play lost (19.5).⁸ Further, overall injury rates in intercollegiate men's lacrosse have previously been reported to be significantly higher than in boy's high school play.⁸ Injury to

the hand and thumb, especially in the form of a fracture, impacts the college athlete on multiple levels: participation in sports, performance of activities of daily living, fulfilling educational responsibilities, and economically.

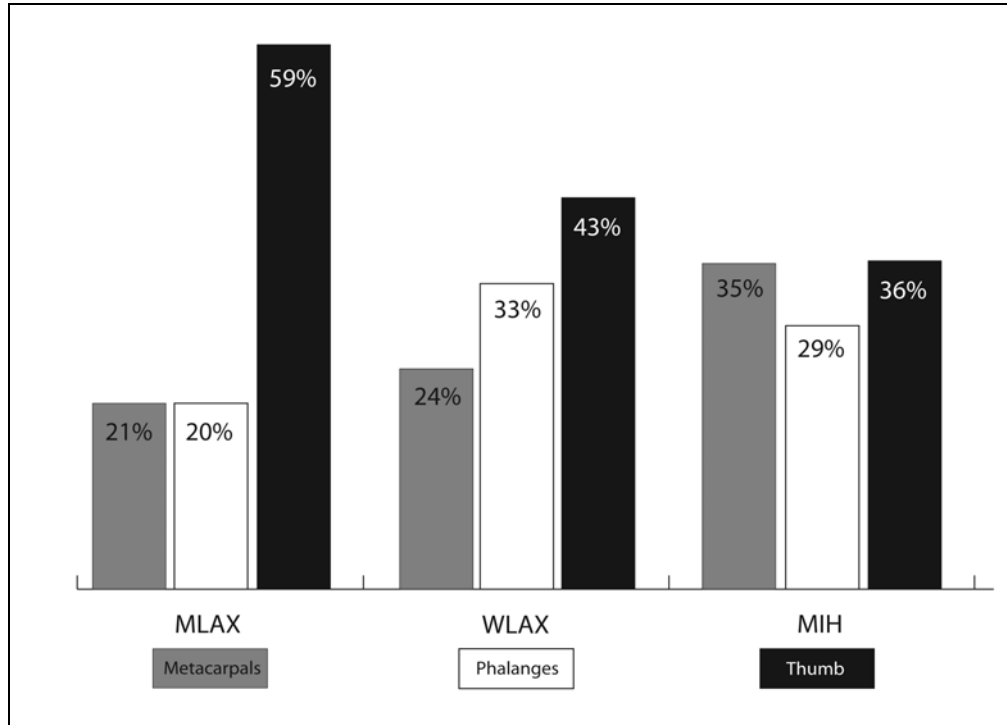


Figure 1. Injuries by bodily location and sport. In men's lacrosse, the thumb is injured significantly more frequently than metacarpals or phalanges.

Our study demonstrates that collegiate men's lacrosse players are at markedly greater risk than other stick-handling athletes for fractures and overall injuries to the thumb. Over half of the injuries sustained to the thumb were the result of a direct contact with an opponent's stick. This is in marked contrast to Dick et al.'s reported rate of only 12.1% of all injuries in the collegiate lacrosse player resulting from such a mechanism of injury,⁶ but consistent with prior findings that direct impact is also the most commonly reported mechanism of injury to the hands among the high school population.⁸

Elkousy et al. previously reported a series of intra-articular fractures of the interphalangeal joint in five thumbs of three NCAA Division I goalkeepers in a 24-month period.⁹ The mechanism of injury in each case was a direct axial load imparted on the thumb. In response, the authors called for "equipment better designed to protect the thumb, such as a

molded plastic insert covering the tip and dorsum of the thumb or a custom-made glove with a more rigid thumb casing". Although the dorsum of the thumb is well padded with foam in men's lacrosse gloves, the unprotected thumb tip is vulnerable to injury. The thumb wraps in the opposite direction of the fingers around the shaft of the crosse, therefore the volar side and tip of the thumb, which are covered only by a thin layer of leather as opposed to the foam dorsal padding, remain poorly protected. Of note, ice hockey gloves provide circumferential padding of the thumb. We suspect that this added protection may be a reason that although overall hand injuries are equally common between the two sports, injuries to the thumb are much less prevalent in men's ice hockey than in lacrosse. (Table 2)

The stated goal of the NCAA ISS is "to be reducing injury rates through suggested changes in rules, protective equipment or

coaching techniques based on data provided by the ISS.^{7,4} Based on our analysis of the ISS, we endorse prior recommendations to reevaluate the composition and style of men's lacrosse gloves^{8,9} in an effort to minimize risk for injury to the hand and thumb in particular. Ideally gloves would provide thickened padding circumferentially as well as at the tip of the thumb, yet remain low-profile enough to not hinder stick-handling abilities. As our analysis identifies a discrepancy in rates of thumb injuries between men's lacrosse players versus other gloved stick-handling athletes, we strongly recommend glove modifications and a prospective, randomized, controlled study to prove effectiveness of modified gloves in the prevention of hand injuries.^{10,11} This would validate a requirement that gloves with improved thumb protection be worn during intercollegiate men's lacrosse practice and competition.

Strengths and weaknesses of this study can be attributed to the inherent nature of the NCAA Injury Surveillance Study. The ISS surveys a wide demographic of programs across the country competing in NCAA Divisions I, II, and III. The reported injuries are interpreted in the context of athlete-exposures such that the sampled rates of injuries are intended to be truly representative of those of the larger competitive population. However, injury rates are a reflection of the reporting performed by athletic trainers and may be subject to reporting bias. Further, an "injury" has been broadly defined as an event which causes the athlete to miss one day of practice or competition. There is no distinction made between the minor injury that causes the athlete to miss a single day of practice versus the injury that requires surgery, is season-ending, or greatly interferes with quality of life. Finally, it was not differentiated in ISS data reporting what percentage of injuries occurred in the right versus left hands or in dominant versus non-dominant hands. Data was also not stratified by position, so we were unable to examine if players in certain positions (attack, midfield, defense or goaltender) are particularly at risk for injuries their hands and thumbs.

Conclusion

In summary, comparison of injury rates between three gloved, stick-handling sports over a sixteen year period demonstrates that men's collegiate lacrosse players are at markedly increased risk for fractures and other injuries of the thumb. We recommend that modifications

be made to the styling and composition of men's lacrosse gloves to improve padding and provide better protection for the vulnerable thumb region.

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