

ORIGINAL RESEARCH

Laryngeal fractures in professional and semiprofessional ice hockey players

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Abstract

Objective: Injuries in professional ice hockey players are common, however significant laryngeal trauma is rare. Here, we present a case series of professional and semi-professional ice hockey players to demonstrate the mechanism and nature of laryngeal injuries they sustain during play, and to recommend best practices for treatment, prevention, and return to the ice.

Methods: A retrospective case review was done of hockey-related laryngeal injuries between 2016 and 2019 at a tertiary laryngology practice. Only semiprofessional and professional hockey players were included.

Results: In total, four cases were included. All cases involved trauma from a hockey puck to the neck. No cases were the result of punching, fighting, high sticks or routine checking. Notably, 1 of 4 presented with severe airway compromise, requiring urgent intubation, whereas most presented with pain or a significant voice complaint. Two patients required operative intervention with open reduction and internal fixation of significantly displaced fractures. One patient experienced significant mucosal disruption with cartilaginous exposure at the posterior vocal complex requiring microflap. The average return to ice was 6 weeks for those who required operative intervention and 4 weeks for those who were managed conservatively. One patient had persistent mild dysphonia and all others had a return to baseline phonation. None were wearing neck guards or other protective equipment at the time of injury.

Conclusion: Though voice and airway injuries are rarely sustained by ice hockey players, they may require urgent intervention. We recommend that protective equipment be worn and improved to prevent laryngeal trauma.

Level of Evidence: 4

KEYWORDS

athletic injuries, hockey, laryngeal fractures, neck injuries, sports injuries

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1 | INTRODUCTION

Laryngeal fractures are rare but potentially life-threatening forms of laryngotracheal trauma that typically result from blunt or penetrating injuries to the neck. Although the incidence of laryngeal fractures is poorly defined, incidence of general laryngeal injury is estimated to be between 1 in every 5000 to 30 000 emergency room visits in the United States.^{1,2} However, these injuries frequently occur in the setting of polytrauma patients and often present with late-onset symptoms. Therefore, they require a high degree of clinical suspicion for recognition of potential injuries.³ Common symptoms seen in the context of laryngeal injury and fracture include dyspnea, neck swelling, pain, dysphonia, and dysphagia. Stridor and subcutaneous emphysema may also develop.³⁻⁵ Severe cases of laryngeal fracture require emergent intervention with tracheostomy or endotracheal intubation.⁴

Previous studies have shown that laryngeal fractures typically present as Schaefer-Fuhrman Class II or III injuries.^{3,6,7} Smaller, non-displaced fractures are typically managed medically with voice rest, head of bed elevation, cool humidified air, anti-reflux medication, and steroids. Displaced fractures (Class III and higher) generally require surgical intervention, such as open reduction internal fixation (ORIF) along with suture closure for potential avulsed vocal cords and mucosal damage.

Fortunately, laryngeal fractures are rare since the larynx is protected by multiple surrounding structures, like the mandible and sternum, that can redirect trauma. Nevertheless, high-impact injuries may result in significant trauma to the neck. This is especially true for contact sports where athletes may experience direct trauma to the thyroid cartilage, cricoid cartilage, and the hyoid.³ Hockey is one such traumatic sport, in which the neck is largely unprotected and vulnerable to direct impact from high-velocity objects. These injuries become potentially life threatening when we consider the intensity of elite-level hockey games. However, there is no current documentation of laryngeal fractures in this rare patient population that experiences a unique mechanism of injury. Here we present a case series of professional and semiprofessional hockey players who have sustained laryngeal fractures, to demonstrate the mechanism and nature of these injuries. We also recommend best practices for prevention, treatment, and return to the ice.

2 | METHODS

Data for this study were collected with approval by the Institutional Review Board of Mass Eye and Ear in accordance with the Declaration of Helsinki and the United States Health Insurance Portability and Privacy Act. Individual patient consent was also obtained. The aim of this study was to characterize laryngeal fracture injuries for ice hockey players who compete at an elite level. Given the high speed and physical play of these athletes, where pucks can routinely exceed 100 mph, specific patterns of laryngeal injury may exist in this patient population. A retrospective review was done of all hockey related laryngeal injuries between 2016 and 2019 at a tertiary laryngology

practice with clinical diagnoses of laryngeal fracture. Only those individuals who competed at a professional or semiprofessional level were included. The mechanism of injury, clinical presentation, clinical course, diagnostic testing, intervention, outcome, and clearance for return to ice was recorded for each patient.

3 | RESULTS

3.1 | Patient descriptions

3.1.1 | Patient 1

A 19-year-old defenseman presented to the ED with hoarse voice, sensation of fullness in the throat, and pain centered in the midline of his neck after being struck in the throat by a hockey puck at practice. Of note, there was no significant stridor or respiratory distress, but he did describe a raspy voice. Computed tomography (CT) imaging demonstrated a displaced vertical fracture on the left side of the thyroid cartilage (Figure 1). There was also evidence of avulsion and perforation of the right false vocal cord area with air extending inferiorly and laterally into the post-cricoid space and tracheo-esophageal groove (Schaefer Class III). Subsequent fiberoptic endoscopy confirmed these mucosal findings with visible perforations and exposed arytenoid cartilage. The patient was admitted for airway watch and on hospital day two, underwent suspension microlaryngoscopy (SML) followed by open reduction and internal fixation (ORIF) of the displaced left thyroid cartilage fracture. The SML demonstrated exposed right arytenoid cartilage and posterior avulsion of the right true vocal cord and exposure of the vocal process. A mucosal microflap was created to cover the posterior aspect of the right vocal process and arytenoid cartilage with a 3-0 vicryl stitch (Figure 2). Attention was then turned



FIGURE 1 Computed tomography scan demonstrating displaced fracture line of left thyroid cartilage and concomitant contralateral mucosal disruption at the posterior aspect of right vocal process

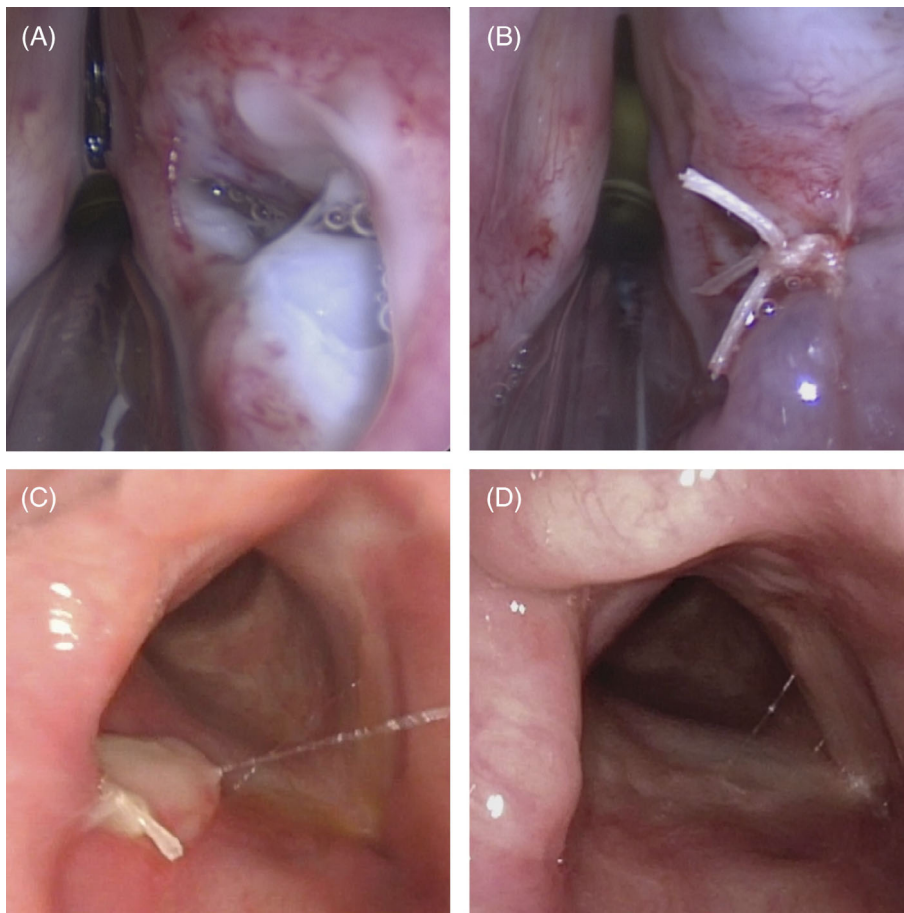


FIGURE 2 Endolaryngeal view of mucosal disruption at right posterior vocal process before intervention, A and after microflap with 3-0 vicryl stitch, B. Depiction of postoperative mucosalization at 2 week follow-up, C and 4 month follow-up, D

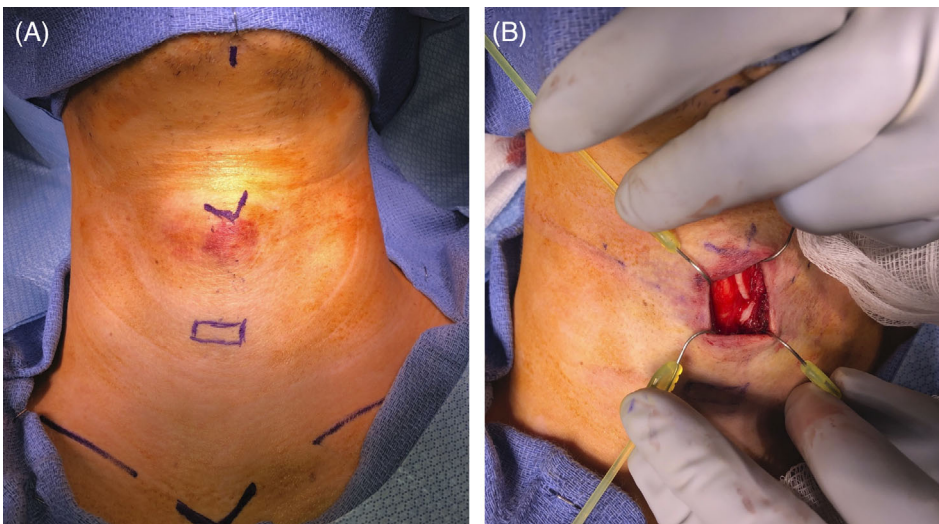


FIGURE 3 Open view of displaced thyroid cartilage fracture with preoperative markings, A and exposed fracture line prior to reduction, B

to the displaced thyroid cartilage fracture. A single large vertical fracture was seen through the thyroid cartilage just left of midline. As a result, the posterior displacement of the thyroid cartilage resulted in foreshortening of the vocal fold (Figure 3). During exposure, care was taken to leave overlying perichondrium on the thyroid cartilage. The fracture was then reduced and sutured in place with 0 prolene stitches through cartilage and perichondrium. The thyroid cartilage

was then plated with a rectangular 1.3 mm mini-plate and 4.0 mm screws (Figure 4). After surgery, the patient remained stable on the floor and was discharged on postoperative day 1. At one-week follow up, the patient was asymptomatic and magnified flexible digital distal-chip nasolaryngoscopy (DCL) noted normal arytenoid mobility, intact sutures, and moderate right vocal cord erythema. At 4 weeks, the patient reported no symptoms, including normal vocalization without

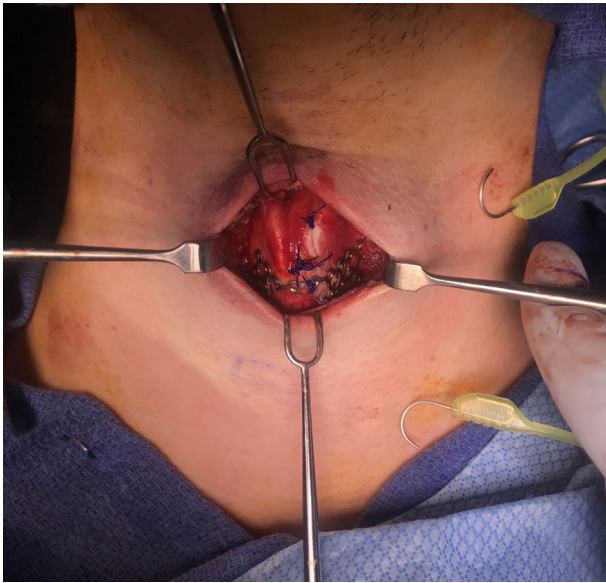


FIGURE 4 Open view of reduced thyroid cartilage fracture with 0 prolene stitches and custom 1.3 mm rectangular miniplate

breathing or swallowing difficulties, and demonstrated complete mucosalization of the posterior vocal complex (Figure 2). The patient was cleared to return to ice hockey with recommendations for new chin and shoulder padding to protect his neck. At 4-month follow-up, DCL with stroboscopy showed intact mucosal waves bilaterally.

3.1.2 | Patient 2

A 22-year-old male goalie presented as a transfer from an outside hospital with complex laryngeal fracture. The patient was struck by a hockey puck in the neck during practice and taken to the ER for evaluation for significant hoarseness, pain with phonation, and difficulty breathing. On presentation to the outside hospital, there was significant stridor and reported left vocal fold immobility, left vocal fold hematoma and possible displacement of the cricoarytenoid joint and on fiberoptic exam. The decision was made to intubate the patient for airway protection prior to transfer to a tertiary care hospital. Subsequent CT imaging showed evidence of right thyroid lamina fracture with 1 cm of displacement and a comminuted cricoid fracture without evidence of vascular injury on CTA. After transfer, the patient underwent SML followed by ORIF. The SML demonstrated a significant hematoma involving the left true vocal cord and left false vocal fold. Edematous tissue was seen at the posterior vocal processes bilaterally, however there was good mobility of both cricoarytenoid joints with a widely patent glottic and subglottic airway. No displacement of the cricoid fracture was seen. In the neck, a primarily vertical fracture was seen on the right side of the thyroid cartilage. This was reduced and sutured in place with 0 prolene stitches and plated with a rectangular 1.3 mm mini-plate and 4 mm screws. The patient was extubated at the end of the procedure and observed in the ICU before ultimately being discharged home on postoperative day 2. At two-week follow

up, the patient reported mild persistent vocal hoarseness but no pain, shortness of breath, or difficulty swallowing. At two-month follow up, the patient reported continued improvement in phonation. DCL was notable for mild left vocal cord paresis. At that time, the patient was cleared for return to ice hockey and did not experience any subsequent functional issues. At 6-month follow-up, DCL was notable for continued improvement of left vocal cord hypomobility.

3.1.3 | Patient 3

A 31-year-old male defenseman presented as a transfer from an outside hospital for evaluation of laryngeal trauma. The patient travelled to the outside hospital after being struck by a hockey puck in the neck during a game. He initially presented with hoarseness, shortness of breath, and neck edema. CT of the neck showed evidence of a non-displaced left anterior thyroid lamina fracture. He was admitted for observation and fiberoptic examination showed intralaryngeal edema. Subsequent DCL with stroboscopy was performed and showed normal arytenoid mobility with smooth vocal edges and appropriate vocal cord mobility and closure. The patient's shortness of breath and throat swelling had resolved by this point in time. Due to the minimal symptoms, surgery was deferred and the patient was cautioned to avoid ice hockey or any other activities that may worsen his injury for at least 2 weeks. This relatively early recommendation was in part due to the patient's strong desire to return to the ice during the ice in the middle of the season. At two-week follow up, re-review of the CT scan suggested that the thyroid lamina fracture may have existed prior to injury and thus may more likely be a chronic fracture. Repeat CT scan and DCL were performed with no notable changes. The patient reported no pain or discomfort, difficulties swallowing, or hoarseness. Since the repeat imaging was consistent with a previous chronic fracture and the patient reported no symptoms, he was cleared for return to ice hockey with follow-up as needed.

3.1.4 | Patient 4

A 30-year-old male defenseman presented for evaluation of his throat after being struck by a hockey puck in the neck 4 days earlier. The patient noticed pain and left-sided throat swelling after the insult, but his symptoms were not severe enough to seek medical attention. He then experienced increasing fatigue with weightlifting, voice changes, and a sensation of a "lump" in his throat when swallowing over the course the next 4 days that prompted his visit. He denied any difficulty breathing, discomfort while speaking, or difficulty swallowing liquids or solids. Physical exam was concerning for a possible step-off on the left lateral aspect of the thyroid cartilage. Initial fiberoptic examination revealed mild asymmetry and a slight rotation of the epiglottic petiole. DLC with stroboscopy demonstrated mild decrease in magnitude of mucosal wave bilaterally, normal arytenoid mobility, and smooth vocal edges bilaterally. Subsequent CT imaging demonstrated a small nondisplaced vertical fracture through the left thyroid lamina

and overlying swelling of the infrahyoid muscles. Secondary findings included an old left anterior thyroid lamina fracture with partial union, slight depression and sclerosis. Since these fractures were small and showed minimal displacement, surgical management was not recommended for this patient. The patient was advised to avoid ice hockey and other contact sports for 6 weeks, enroll in a voice therapy program, and follow-up in 3-6 months for re-evaluation.

3.2 | Patient characteristics and treatment

All of the patients included in this study were otherwise healthy male ice hockey players between the ages of 19 and 31. Every case resulted from direct trauma from a hockey puck—no cases were the result of fighting, high sticks or routine checking. Notably, 1 of 4 cases presented with severe airway compromise, requiring urgent intubation. Although 3 of 4 cases had shortness of breath, only 50% of cases that required operative intervention had respiratory distress as a predominant presenting symptom. All patients presented with pain and dysphonia. Both patients who were treated with conservative management sustained Schaeffer-Fuhrman Class II fractures, whereas the two patients who required operative intervention sustained

Schaeffer-Fuhrman Class III fractures.^{7,8} The description for this laryngotracheal injury classification is shown in Table 1. None of these patients required tracheostomy and only one patient was intubated preoperatively (with subsequent extubation in the operating room on postoperative day 0). Three of four cases were seen in defensemen while the remaining case was seen in a goaltender. None of the four cases wore specific neck guards or neck protectors.

In both operative cases, there was a displaced vertical fracture of the thyroid cartilage just lateral to midline with a significant concomitant mucosal injury at the contralateral posterior vocal process. In one case, this resulted in significant mucosal disruption with exposed cartilage requiring a microflap. In the other case, there was a significant hematoma in this area along with vocal fold immobility. Both cases underwent SML prior to ORIF with 0 prolene suture and a custom 1.3 mm rectangular miniplate.

Nonoperative cases that sustained a Schaeffer-Fuhrman Class II injury returned to the ice in an average of 4 weeks without significant issue. Both of these patients had a return to their baseline voice. Operative cases that sustained a Schaeffer-Fuhrman Class III injury returned to the ice in an average of 6 weeks without significant issue thereafter. One patient had a return to their baseline phonation at their 1 month follow up. The other had continued improvement in their vocal cord paresis and phonation with persistent mild dysphonia at 6 month follow up. These findings are summarized in Table 2.

TABLE 1 The Schaeffer-Fuhrman laryngotracheal injury classification system^{7,8}

Class	Description
I	Minor endolaryngeal hematoma without evidence of fracture
II	Edema, hematoma, minor mucosal disruption without exposed cartilage, nondisplaced fractures
III	Massive edema, mucosal disruption, exposed cartilage, vocal fold immobility, displaced fracture
IV	Group 3 with two or more fracture lines or massive trauma to laryngeal mucosa
V	Complete laryngotracheal separation

4 | DISCUSSION

Laryngeal fractures represent a rare but significant type of traumatic injury within the head and neck. This is an important consideration for ice hockey players in particular, as they have an increased risk of head and neck injury relative to both other injury types and athletes in other sports.⁹⁻¹² For professional hockey players, life-threatening neck injuries have been well documented. However, these reported cases are typically from penetrating trauma resulting in vascular injury to the great vessels.^{13,14} Conversely, blunt trauma injuries may result

TABLE 2 Patient characteristics of elite level ice hockey players with laryngeal fractures including basic demographics, description of injury, management, and return to ice

Patient	Age	Sex	Mechanism of injury	Schaeffer class	Presenting symptoms	Management	Intubation	Tracheostomy	Return to ice	Voice outcome
1	19	M	Hockey Puck	III	Pain, dysphonia	Open (ORIF, Sutures + Miniplate) Endoscopic (SML, Mucosal Flap)	No	No	4 weeks	Baseline
2	22	M	Hockey Puck	III	Pain, dysphonia, shortness of breath	Open (ORIF, Sutures + Miniplate) Endoscopic (SML)	Yes	No	8 weeks	Mild dysphonia
3	31	M	Hockey Puck	II	Pain, dysphonia, shortness of breath	Conservative	No	No	2 weeks	Baseline
4	30	M	Hockey Puck	II	Pain, dysphonia, shortness of breath	Conservative	No	No	6 weeks	Baseline

Abbreviations: ORIF, open reduction and internal fixation; SML, suspension microlaryngoscopy.

in laryngeal fractures—another potentially emergent situation that has yet to be described for this patient population.

With the constant evolution of hockey, understanding the potentially life-threatening consequences of these blunt trauma mechanisms has become increasingly important. Since the National Hockey League (NHL) introduced the *Hardest Shot* competition at its annual All-Star Game, the recorded speeds of the winning slapshots have increased by over 13% from Al Iafrate's inaugural 96.0 mile per hour (mph) mark in 1990, to Zdeno Chara's record setting 108.8 mph slapshot in 2012. This continual progression has been in large part due to the technological advancements that continue to be incorporated in the game. Carbon fiber sticks have replaced wooden sticks, resulting in significant improvements to the velocity of slap shots. These improvements are not unique to NHL players. The current hardest shot record recognized by the NHL was achieved at an All-Star Game for the American Hockey League—the NHL's primary developmental league—by Martin Frk in 2020, reaching a speed of 109.2 mph.¹⁵

In 100% of our laryngeal fracture cases, the primary mechanism of injury was a hockey puck hitting the neck. Given the reported velocity achieved by professional hockey player slapshots, it is unsurprising that multiple cases resulted in significant displaced fractures or mucosal disruption requiring operative intervention. One case was severe enough to warrant urgent intubation at an outside facility before transfer to a tertiary care center. Three of four cases were defensemen while the most severe injury—from an airway perspective—was a goaltender. This may be attributable to the nature of each position. Defensemen and goaltenders often find themselves within the shooting lane, to either blocking a shot or make a save. For defensemen, pucks may often be deflected off of sticks or other body parts before making contact. Goaltenders, however, are commonly within the primary line of sight of any given shot.

Although this case series is limited, it provides valuable insight to mechanisms through which elite level ice hockey players might sustain laryngeal fractures and the necessary operative interventions. Every player in this series experienced blunt trauma to the neck from a hockey puck that resulted in a vertical fracture of the thyroid cartilage. In the two cases that were managed conservatively, nondisplaced fractures were seen. Both nonoperative cases also demonstrated evidence of old laryngeal fractures. This suggests that the incidence of laryngeal fractures may be higher in this patient population than previously reported, partly due to their willingness to play through significant injury. The two more severe cases resulted in Schaefer-Fuhrman Class III injuries where the vertical fractures were significantly displaced.

Interestingly, both operative cases demonstrated a concomitant mucosal injury at the posterior aspect of the contralateral vocal fold process. Both had significant mucosal edema and hematoma, with one case demonstrating mucosal disruption and cartilage exposure requiring a microflap. This underlines the importance of having a high suspicion of mucosal injury when a laryngeal fracture is seen. Initial workup should include direct visualization of the larynx with a flexible nasopharyngoscope.² Professional hockey players are commonly

within the line of sight of a shot, however direct injuries to the midline may be less prevalent due to bracing or head turning in anticipation of a puck. This may result in an oblique line of action for the puck and a counterintuitive site of mucosal injury. In these cases where an endolaryngeal and open approach are required, we advocate performing the SML before attempting an ORIF for a displaced fracture. Often, the cartilaginous framework of younger patients is soft and malleable, making it difficult to keep in a reduced position. As a result, the significant forces associated with SML¹⁶⁻¹⁸ may result in disruption of the reduction.

None of the patients reported in this series required tracheostomy. Although this may be more common in patients experiencing polytrauma or other mechanisms of injury,^{6,19} focal blunt trauma to the neck in athletes should be assessed on a case-by-case basis. Similarly, return to playing should be an individualized process. Our operative cohort had an average return to ice of 6 weeks compared to 4 weeks for our nonoperative group. We felt that this time frame would allow for appropriate union of the fracture and allow each player to slowly re-acclimate to contact drills and full play. In all cases, it was recommended that a neck guard or neck protector should be worn to prevent future injuries. Despite the NHL's lack of enforcement of this type of protective equipment,²⁰ neck guards are currently the only means of dampening a significant blunt or penetrating trauma to the neck. Appropriate protection in this area may mitigate the level of intervention necessary or prevent future injuries.

The study herein has obvious limitations inherent to its retrospective nature and limited sample size. A broader analysis of laryngeal injuries in professional ice hockey players will help delineate the mechanisms of injury and appropriate interventions. However, given the rare nature of this injury, our study provides valuable insight to the management and course of professional and semiprofessional ice hockey players who suffer laryngeal fractures.

5 | CONCLUSION

Although voice and airway injuries are rare in professional ice hockey players, they may require urgent intervention. Blunt trauma from hockey pucks may result in laryngeal fractures that require operative intervention from an open and endolaryngeal approach. In these cases, we advocate maintaining a high suspicion for concomitant mucosal injury if a displaced fracture is seen and performing SML prior to reduction.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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BIBLIOGRAPHY

1. Lee WT, Eliashar R, Eliachar I. Acute external laryngotracheal trauma: diagnosis and management. *Ear Nose Throat J*. 2006;85(3):179-184.
2. Sethi RKV, Khatib D, Kligerman M, Kozin ED, Gray ST, Naunheim MR. Laryngeal fracture presentation and management in United States emergency rooms. *Laryngoscope*. 2019;129(10):2341-2346.
3. Moonsamy P, Sachdeva UM, Morse CR. Management of laryngotracheal trauma. *Ann Cardiothorac Surg*. 2018;7(2):210-216.
4. Mendis D, Anderson JA. Blunt laryngeal trauma secondary to sporting injuries. *J Laryngol Otol*. 2017;131(8):728-735.
5. Paluska SA, Lansford CD. Laryngeal trauma in sport. *Curr Sports Med Rep*. 2008;7(1):16-21.
6. Jalisi S, Zoccoli M. Management of laryngeal fractures – a 10-year experience. *J Voice*. 2011;25(4):473-479.
7. Schaefer SD. The acute management of external laryngeal trauma. A 27-year experience. *Arch Otolaryngol – Head Neck Surg*. 1992;118(6):598-604.
8. Fuhrman GM, Stieg FH 3rd, Buerk CA. Blunt laryngeal trauma: classification and management protocol. *J Trauma*. 1990;30(1):87-92.
9. Gerberich SG, Finke R, Madden M, Priest JD, Aamoth G, Murray K. An epidemiological study of high school ice hockey injuries. *Childs Nerv Syst*. 1987;3(2):59-64.
10. Hutchinson MR, Milhouse C, Gapski M. Comparison of injury patterns in elite hockey players using ice versus in-line skates. *Med Sci Sports Exerc*. 1998;30(9):1371-1373.
11. Matic GT, Sommerfeldt MF, Best TM, Collins CL, Comstock RD, Flanigan DC. Ice hockey injuries among United States high school athletes from 2008/2009-2012/2013. *Phys Sportsmed*. 2015;43(2):119-125.
12. Bartley JH, Murray MF, Kraeutler MJ, et al. Epidemiology of injuries sustained as a result of intentional player contact in high school football, ice hockey, and lacrosse: 2005-2006 through 2015-2016. *Orthop J Sports Med*. 2017;5(12):2325967117740887-22325967117740888.
13. Bisson LJ, Sanders SM, Noor S, Curl R, McCormack R. Common carotid artery laceration in a professional hockey player: a case report. *Am J Sports Med*. 2009;37(11):2249-2251.
14. Malarchuk C. *Bleeding Out*. 2018; <https://www.theplayerstribune.com/en-us/articles/clint-malarchuk-bleeding-out>. Accessed April 26, 2020.
15. NHL. *Martin Frk Breaks All-Time Record for Hardest Shot*. 2020; <https://www.nhl.com/kings/news/martin-frk-breaks-all-time-record-for-hardest-shot/c-314339664>. Accessed April 26, 2020.
16. Feng AL, Song PC. Laryngeal force sensor: quantifying extralaryngeal complications after suspension microlaryngoscopy. *Otolaryngology–Head Neck Surg: Off J Am Acad Otolaryngol-Head Neck Surg*. 2018;15(2):328–334.
17. Feng AL, Puka E, Ciaramella A, et al. Force metrics and suspension times for microlaryngoscopy procedures. *J Voice*. 2019;S0892-1997(19):30410–2.
18. Feng AL, Ciaramella A, Naunheim MR, Gadkaree SK, Fat I, Song PC. Laryngeal force sensor metrics are predictive of increased perioperative narcotic requirements. *Laryngoscope*. 2018;129(11):2563–2567.
19. Bent JP 3rd, Silver JR, Porubsky ES. Acute laryngeal trauma: a review of 77 patients. *Otolaryngology–Head Neck Surg: Off J Am Acad Otolaryngol-Head Neck Surg*. 1993;109(3 Pt 1):441-449.
20. NHL. *Even After Richard Zednik's Frightening Injury, Don't Expect Neck Guards in NHL*. 2008; <https://www.nhl.com/news/even-after-richard-zedniks-frightening-injury-dont-expect-neck-guards-in-nhl/c-353353>. Accessed April 24, 2020.

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