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Hurling and Camogie Related Blunt Laryngeal Trauma

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Abstract

Aims

To describe the clinical characteristics, treatment and outcome of laryngeal injuries sustained during hurling and camogie matches in the South East of Ireland. We aim to emphasise the serious nature of these injuries and heighten the awareness among sport physicians.

Methods

A retrospective analysis was undertaken of all hurling or camogie related laryngeal injuries that presented to the Department of Otolaryngology at Waterford Regional Hospital between January 2005 to January 2020, utilising the Hospital In-Patient Enquiry (HIPE) system.

Results

During this period 21 patients presented to the otolaryngology service with suspected laryngeal trauma due to hurling or camogie related injuries. The most common presenting complaints were hoarseness 90% (19 patients) and odynophagia 76% (16 patients) with all patients describing either or both 62% (13 patients). Tenderness over the laryngeal apparatus was the most consistent clinical sign 100% (21 patients). Haemoptysis was closely associated with thyroid cartilage fracture χ^2 (1, N=21) =21, p=0.000. The presence of surgical emphysema and shortness of breath were significantly associated with airway intervention, χ^2 (1, N=21) =9.97, p=0.002 and χ^2 (1, N=21) =4.42, p=0.035 respectively. Three patients had a thyroid cartilage fracture of which one needed a tracheostomy for an associated inter-arytenoid and supraglottic laceration.

Conclusion

Laryngeal injuries are uncommon but a potentially fatal condition, which poses a risk to the voice and airway of athletes who sustain blunt neck trauma. The assessment and management of a patient with suspected laryngeal injury should be carried out by experienced medical practitioners. Consideration of further protective equipment by the governing sports body should be undertaken.

Introduction

Hurling is one of the oldest field games in the world and has been part of the Irish culture for at least 3,000 years. The earliest literary reference dates back to 1272 BC and has been part of many ancient Irish legends and folklore. There has been a significant correlation between hurling and trauma throughout history. From the legend Táin Bo Cuailgne where a young hero uses a hurley and sliotar to kill a vicious hound, to the 7th and 8th century AD Irish laws, which describe various hurling injuries that should be compensated[1]. Unsurprisingly, hurling remains in many counties Ireland's most popular sporting event. For readers outside of Ireland hurling is a contact team sport which resembles hockey or Scottish shinty and is played with a curved wooden stick (hurley) and a hard leather ball (sliotar). Camogie is the female version of the game using a slightly smaller stick and ball and a few minor rule differences. There is no restriction on the height to which the hurley may be raised, or to the projection of the ball, with speeds reaching up to 160 km/h and in air contests often leading to traumatic player-player collisions. It is therefore not surprising that, compared with other team sports, hurling has a very high injury rate of 102 hours per 1,000 hours of match play at the elite level, compared to 91, 12, 11 hours for rugby, lacrosse, and ice hockey respectively[2]. It accounts for around 40% of all sports related injuries seen in Irish hospitals[3].

In 2005 the Gaelic Athletic Association (GAA), Ireland's regulatory body for hurling implemented a recommended standardized helmet with faceguard protection to all children under 16 years of age. Mostly due to concerns regarding a high incidence of facial trauma and ocular injuries. These rules were extended to all under 21's in 2006 and eventually to all players in 2010. The introduction of protective headgear resulted in an 80% drop in hurling related ocular injuries seen in a regional hospital in Ireland[4].

Laryngeal injury due to sport is uncommon with only a few case reports in the literature[5], with more emphasis on ocular injuries or orthopaedic trauma. However, the serious nature of laryngeal injury cannot be overlooked due to the possible progression of airway compromise and death. The diagnosis of laryngeal trauma is frequently missed by sports physicians, as many of the signs and symptoms will have a delayed onset. However, with a high index of suspicion and prompt management, preventing serious adverse outcomes can be achieved.

The purpose of this report is to document the laryngeal injuries related to hurling and camogie, seen at a Regional Otolaryngology Department over a 15 year period. We aim to emphasise the serious nature of these injuries and heighten the awareness amongst sport physicians of sports related laryngeal injuries.

Methods

Waterford Regional Hospital is the regional otolaryngology centre for the south east of Ireland with a catchment area of 470,000 people and serves five hurling playing counties including County Waterford, Tipperary, Kilkenny, Carlow, and Wexford.

A retrospective analysis was undertaken of all hurling and camogie related laryngeal injuries that were admitted under the care of the Otolaryngology team at Waterford Regional Hospital between January 2005 to January 2020 using the Hospital In-Patient Enquiry (HIPE) system.

From charts the following were recorded: demographic data, mechanism of injury (ball, stick, or other), presenting symptoms and signs, findings on radiographic investigations, management, length of stay and quality of voice at follow up visits. Results were reported as percentages, means, standard deviation and range. The Chi squared test was used to assess distribution of certain signs and symptoms in significant outcomes. Statistical analyses were performed using IBM SPSS Statistics 25.

Results

Demographic Data

During the study period twenty one patients were seen with hurling or camogie related laryngeal injuries. The mean age was 20.2 (SD 6.86, range 13-35) years. Half of those injured were 16 years and younger. eighteen were male and three were female camogie players, which is the female version of the sport. Of the 21 injuries, 18 were as a result of the hurley, four by the sliotar (ball) and three were injuries from collision with another player's elbow or knee.

Overall the patients presented on average 11.1 (SD 18.5, range 1-72) hours after the injury, with one patient only being referred to otolaryngology three days and one patient two days after the initial injury. Excluding these patients the average time to presentation was 5.4 (SD 5.94, range 1-24) hours. Nine patients were referred from other hospitals, eight patients were self-presenters to the emergency department and four were referred in by general practitioners.

Symptoms and Signs

The most common presenting complaints were hoarseness 90% (n=19) and odynophagia 76% (n=16) with all patients describing either or both 62% (n=13). Other presenting complaints included respiratory distress seen in 33% (n=7) of patients. Tenderness over the laryngeal apparatus was the most consistent clinical sign and was present in all of patients with a laryngeal injury 100% (n=21). Three patients reported haemoptysis, all associated with thyroid cartilage fracture χ^2 (1, N=21) =21, p=0.000). Mild stridor was reported in two patients both with bilateral vocal cord hematomas. Surgical emphysema was only apparent in one patient who had laryngeal fracture and mucosal laceration necessitated the insertion of a tracheostomy. The presence of surgical emphysema and shortness of breath were significantly associated with airway intervention, χ^2 (1, N=21) =9.97, p=0.002 and χ^2 (1, N=21) =4.42, p=0.035 respectively.

Laryngeal Fractures

Three patients had a fracture of the thyroid cartilage. As mentioned above, one necessitated the insertion of an emergency tracheostomy under general anaesthesia due to an associated interarytenoid and supraglottic laceration. The injury was a result of contact with an opponent's hurley. Presenting signs and symptoms included haemoptysis, odynophagia, hoarseness, and surgical emphysema over the anterior aspect of the neck. Supraglottic laceration was noted on flexible laryngoscopy. CT neck findings included evidence of a left thyroid cartilage fracture, surgical emphysema, and a perforation of the infra-hyoid supraglottis (Figure 1). After the tracheostomy, the patient was admitted to ICU overnight, where he underwent nasogastric feeding for nine days. De-cannulation was performed on day eleven and a month after discharge the patient had no voice or swallowing difficulties, notably flexible laryngoscopy was normal.

The second case similarly had signs and symptoms of haemoptysis, odynophagia, and dysphonia, after being hit with a hurley. On examination there was tenderness over the laryngeal area and flexible laryngoscopy revealed a left arytenoids and supraglottic hematoma. CT scan of the neck reported a medially depressed fracture of the right thyroid cartilage (Figure 2). He was treated conservatively with humidified air and intravenous antibiotics. A month after discharge, his only complaint was mild vocal fatigue, however laryngeal examination was normal.

The third patient with a thyroid cartilage fracture, presented with dysphonia and odynophagia after being hit by a hurley over the anterior neck. He had bruising over the thyroid cartilage and flexible laryngoscopy showed a hematoma of the right false and true vocal cord. CT scan demonstrated a left thyroid cartilage fracture. This was treated conservatively with analgesia and hydrocortisone. On follow up one month later, there was no voice or swallowing difficulties. Clinical examination demonstrated a slight prominence of the thyroid cartilage externally.

The average length of stay for a patient with a thyroid cartilage fracture was 6 days (SD 5.1 Range 3-12). The mean age of the patients with a fracture was 26.9 years (SD 7.5 range 20.3-35.1).

Laryngeal Soft Tissue Injuries

Fifteen patients suffered a laryngeal hematoma with two having bilateral vocal cord hematomas and a further three exhibiting extensive supraglottic hematomas. (Figure 3) One patient had significant compression of the airway, requiring intubation and ICU admission. Following extubation, the patient was treated conservatively with antibiotics and intravenous steroids. Two of the three patients were admitted for airway observation, conservative treatment and discharged after 48 hours. One patient presented to the emergency department with acute shortness of breath, tachypnoea, and noisy breathing, one hour after anterior neck trauma. Flexible laryngoscopy revealed paroxysmal vocal cord dysfunction and lateral x-ray of the neck was normal. These symptoms were thought to be related to anxiety and resolved after benzodiazepam administration and observation for 48 hours.

Two patients exhibited soft tissue lacerations and four had reduced vocal cord movement. These patients were managed conservatively with humidified oxygen, steroids, and observation for 24-48 hours. Unfortunately, only 76% (16 patients) attended clinical follow-up in the outpatient department. Two patients reported persistent dysphonia and one patient complained of a prominent laryngeal cartilage.

Discussion

Injuries are an inevitable part of contact sports. Hurling related head, facial[4,6,7,8] eye[9-12] and hand injuries[13] have previously been documented but this is the first report on hurling related laryngeal trauma. Laryngeal trauma during sport is potentially life threatening due to airway compression and oedema[14].

Symptoms after blunt trauma to the neck can be subtle and delayed in onset. Sports physicians should be attentive to even minor anterior neck trauma and not be distracted by other more obvious facial and neck injuries[15]. As noted by other authors[16-19], and also reflected in our group of patients, subtle symptoms like dysphonia and odynophagia should not be ignored. Instead such patients need urgent referral to the otolaryngology department for laryngoscopy and 48 hour airway observation. As reflected in the literature[19], hematomas may continue to expand in the first 24 hours leading to further airway compromise. Haemoptysis and surgical emphysema can point to a more serious endolaryngeal soft tissue laceration or laryngeal fracture. The common presenting symptoms of laryngeal trauma include hoarseness / dysphonia / aphonia; odynophagia / dysphagia; pain; haemoptysis / haematemesis; difficulty / noisy breathing. Common signs include tenderness of larynx; bruising / swelling over the neck; drooling; stridor; surgical emphysema; loss of laryngeal prominence; respiratory distress.

Fibreoptic endoscopy remains the mainstay for the initial diagnosis of mucosal airway injuries but additional information regarding the laryngeal framework is obtained with radiological evaluation including plain radiographs and computed tomography. Laryngeal fracture, hyoid bone elevation, suggestive of cricotracheal separation, and surgical emphysema are concerning features[20].

The soft tissue sequelae from blunt trauma to the neck varies from submucosal hematomas, mucosal lacerations, damage to the intrinsic laryngeal muscles and ligaments, recurrent laryngeal nerve paralysis and complete laryngotracheal separation. In adults and older teenagers the narrowest portion of the airway is at the level of the true vocal cords where even small hematomas can compromise the airway. As observed in our case series, children have a higher incidence of soft tissue injuries as their laryngeal skeleton is more elastic and situated higher in the neck and thus better protected by the mandible. In adults, ossification of the thyroid and cricoid cartilages can result in fragmentation after crushing anterior forces.

Laryngeal injury is most often categorised by the Schaefer-Fuhrman classification[21] as summarised in Table 1. Treatment is divided into conservative and surgical management on an individualised basis. In cases of a compromised airway, immediate management following ATLS guidelines[22] is recommended to secure the airway. If safe endotracheal intubation is not possible, tracheostomy may be necessary. Stable patients (Group 1 and 2) are best managed with conservative methods, including humidified oxygen, intravenous steroids, proton pump inhibitors, antibiotics, and voice rest with serial flexible nasendoscopy examination. For group 3 and above, the recommendation is for surgical assessment and intervention. Mild to moderate lacerations may be repaired endoscopically to cover exposed cartilage and prevent scaring and stenosis[23]. Displaced fractures or extensive mucosal injuries require open surgery for exploration and primary closure via thyrotomy[24]. Tracheostomy and nasogastric feeding may be required for a prolonged period of healing. Stabilisation of fractures can be obtained with suturing, wire fixation or plating with two point fixation. Endolaryngeal stenting is reversed for the most severe injuries including comminuted fractures, disruption of the anterior commissure or obliteration of the laryngeal lumen[24]. Clinical follow-up and speech and language therapy input is important for long term management. Overall, early assessment and management are associated with superior airway and vocal outcomes[23].

***Table 1**: Schaefer-Fuhrman Classification.*

Group	Injury
1	Minor endolaryngeal haematoma, oedema, or laceration without detectable fracture
2	Oedema or haematoma, minor mucosal disruption without exposed cartilage and non-displaced fractures noted on CT
3	Massive oedema, mucosal disruption, displaced fractures, exposed cartilage +/- cord immobility
4	Group 2 + two or more fracture lines, skeletal instability, or significant anterior commissure trauma
5	Complete laryngotracheal separation

Protective head gear was introduced by the Gaelic Athletic Association in 2005 as a result of the Flynn et al[10] findings on the nature of ocular injuries in hurling. A move which led to a significant drop in eye injuries. However, the current protective equipment and nature of the game exposes the neck to high impact trauma and significant injury. Despite the restricted numbers and resultant statistical limitation, our study demonstrates that the current protective equipment needs further optimization for adequate laryngeal and airway security.

Life threatening laryngeal injuries may be prevented by the introduction of a neck guard that is already employed in other contact sports such as ice hockey. We hope this study will encourage the GAA community to consider the risk of laryngeal injury and introduce a neck guard to further safeguard the athletes. Quinlan et al recently encouraged helmet manufacturers to re-engage with players to ensure that current safety equipment meets the functional demands of the modern player while adhering to approved manufacturing standards[25]. Promoting awareness of laryngeal injuries within the sports medicine community, primary care centre and emergency services will optimise access for specialty assessment and management in a timely fashion.

In summary, hurling related laryngeal trauma has the potential for serious and indeed life-threatening consequences due to the subtle and delayed nature of the symptoms. Sports physicians should have a high index of suspicion in their approach to the assessment of players with even minor head and neck trauma. Players with a suspected laryngeal injury should be referred early on to an otolaryngologist for assessment and observation. Whilst eye and head trauma in hurling has received particular emphasis, it is important to increase efforts to protect the larynx with the appropriate protective equipment.

Figure 1: *Axial CT neck depicting evidence of a left thyroid cartilage fracture, surgical emphysema, and a perforation of the infra-hyoid supraglottis.*

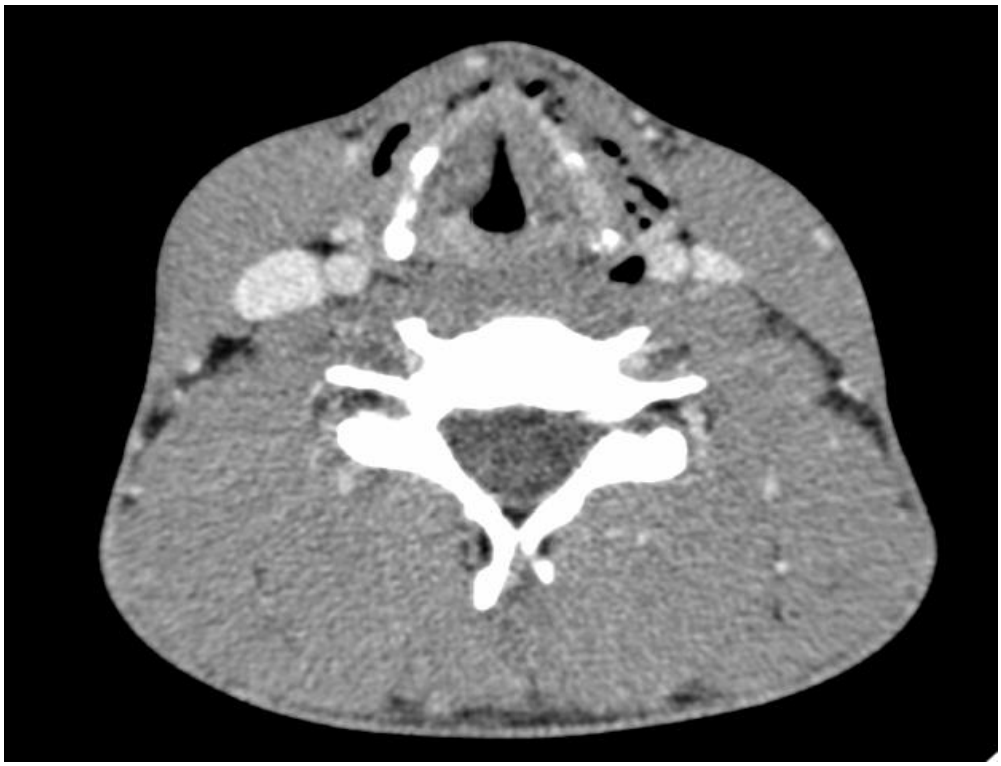

Figure 2: *Axial CT image depicting a medially depressed fracture of the right thyroid cartilage.*

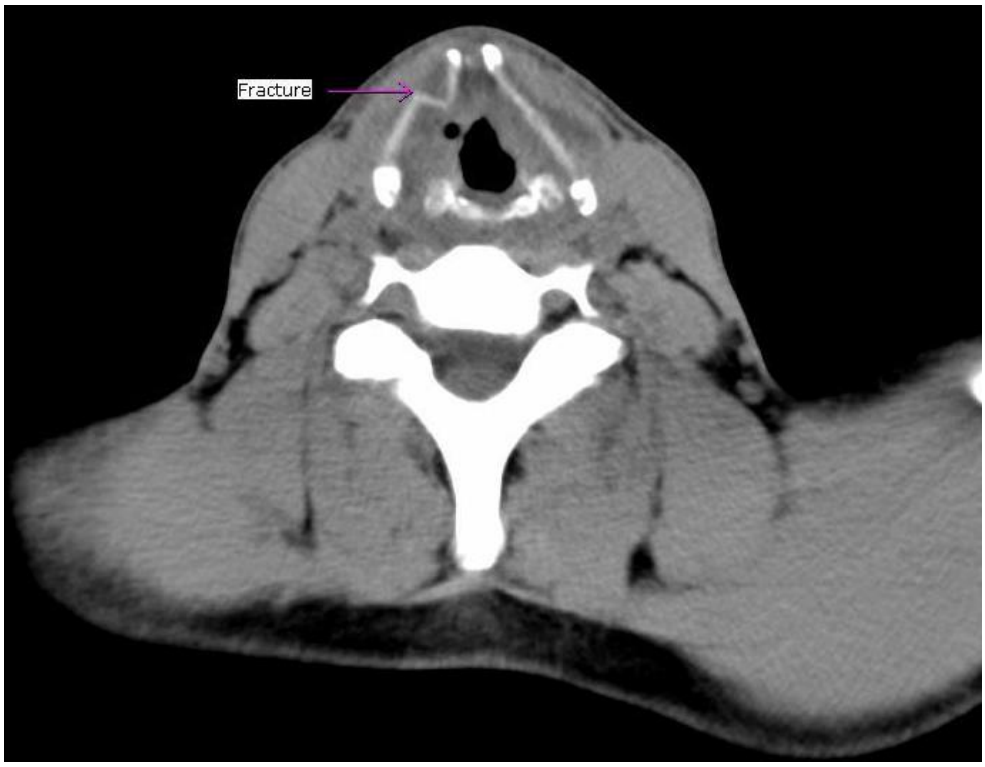

Figure 3: *Axial CT image of a right sided expansive laryngeal haematoma that required intubation.*

Declaration of Conflicts of Interest:
The authors declare that they have no competing interests or funding.

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