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SCIENTIFIC LETTERS

Laryngeal injury in closed cervical traumatism☆

Lesión laríngea en el traumatismo cervical cerrado

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The incidence of traumatic laryngeal injury in the United States is 1 case for every 30 000 patients.[1] Closed laryngeal injury (CLI) is rare, its prognosis is worse than penetrating trauma, and its mortality rate is up to 40%.[2] This prognosis is related to the management of the airway (AW) whose prehospital mortality is up to 80%[3] and to associated injuries.

In our ICU we provided care to 1363 patients from 2012 through 2016 and 6 of these patients showed CLI of extrinsic origin. The general characteristics, physical examination, management of the AW, radiologic findings, and treatment are shown in Table 1.

Case #1

Motorcycle accident. Patient transferred with Venti-Mask, with rigid Philadelphia cervical collar (PCC) and lateral cervical immobilizer with neck pain and subcutaneous emphysema, patent airway (PAW) and hemodynamic stability (HS). During the radiologic study, the patient developed dyspnea with decreased oxygen saturation that required orotracheal intubation (OTI) using the FROVA® intubating introducer with Cormack-Lehane grade III. The study confirmed the presence of one transverse fracture without displacement of thyroid cartilage (TC) and cricoid cartilage (CC). It was decided to perform a surgical tracheostomy procedure.

Case #2

Patient transferred from a different hospital after being involved in a fight and complaining of pain, dysphagia and dysphonia, but PAW. The computed tomography scan confirmed the fracture of the TC with a 4 mm separation between the fragments and fracture-luxation of the arytenoid cartilage (Fig. 1). Since surgery was not an option in this center, one OTI was performed and the patient was transferred to our hospital (where another CT scan was performed due to lost images that confirmed the aforementioned findings) wearing a PCC stabilizer. The ear, nose and throat (ENT) unit of our hospital was contacted, and they performed open reduction and internal fixation (ORIF) surgery.

Case #3

Motorcycle accident. Patient transferred with reservoir facial mask and PCC. The patient was in pain and showed 2 incised and lacerated wounds in the anterior region of the neck with spontaneous air leak and significant subcutaneous emphysema. The chest X-ray performed confirmed the presence of one pneumothorax that started with HS but showed progressive dyspnea that required chest drain *in situ*. The CT scan showed 3 lines of fractures in the TC and solution of continuity of the mucosa (Fig. 1B). The patient was transferred with PAW straight to the operating room where tracheostomy and ORIF procedures were performed.

Case #4

Physical aggression transferred with reservoir facial mask. The patient showed facial edema and cervical emphysema and complained of pain and dysphonia. Since the AW was compromised, it was decided to proceed with an urgent OTI with Airtraq® using the FROVA® intubating introducer with Cormack-Lehane grade IV. The CT scan confirmed the presence of one sagittal fracture of the TC, cervical emphysema, and pneumomediastinum in continuity (Fig. 1C). The ENT unit was consulted, and conservative treatment was recommended.

Case #5

Bicycle fall injury. The patient complained of dysphagia, dysphonia and cervical pain. Patient transferred on Venti-Mask and lateral cervical immobilization. Tracheal deviation and inflammation at tracheal level was confirmed so PPC immobilization was decided. With PAW, the CT scan confirmed the presence of one nondisplaced fracture of the left TC. The ENT unit performed one endoscopy using a flexible fiberscope that revealed the presence of one pharyngeal hematoma and cortical integrity at the TC fissure level, which is why it was decided to proceed with conservative treatment.

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Table 1 Characteristics and lesions of the patients: clinical management.

Number	Age	Sex	Cause	HR O_2Sat.	SABP mm Hg	ISS	Clinical manifestations	Examination of the neck	Airway	Schaefer Furhrman	Radiologic findings on the CT scan	Treatment
1	41	M	Motorcycle	18 100% MVS	126	24	Pain	Inflammation, subcutaneous emphysema	Venti-Mask, OTI, Tracheostomy	III	Transverse nondisplaced fracture of TC Fracture of CC with ectopic air and ruptured airway 3. Arytenoid dislocation	Conservative[a] exploratory
2	31	M	Aggression	17 98% OTI	120	20	Pain, dysphagia, dysphonia	Inflammation	OTI	III	Fracture with a 4 mm opening Arytenoid fracture-dislocation Lateral–cervical subcutaneous emphysema	ORIF
3	35	M	Motorcycle	20 90% RFM	134	22	Pain	Superficial incision, subcutaneous emphysema	Urgent tracheostomy	III	1. Nondisplaced fracture of the TC in 3 sections with emphysema Mucosa with solution of continuity	ORIF

Table 1 (*Continued*)

Number	Age	Sex	Cause	HR	O_2Sat.	SABP mm Hg	ISS	Clinical manifestations	Examination of the neck	Airway	Schaefer Furhrman	Radiologic findings on the CT scan	Treatment
4	30	M	Aggression	18	98% RFM	126	21	Pain	Severe inflammation, subcutaneous emphysema, hematoma	OTI	II	Fracture of the sagittal cartilage of the TC with emphysema Fracture of posterior-superior horns	Conservative[a] exploratory
5	42	M	Bicycle fall injury	15	97% basal	130	14	Pain, dysphagia, dysphonia	Tracheal deviation	Venti-Mask	II	1. Minor endolaryngeal hematoma; airway caliber < 50% 2. Medial fracture of TC	Conservative[a] exploratory
6	80	F	Strangling	26		150	9	Dolor, dysphagia, stridor	Erosions	Urgent tracheostomy	II	Increased thickening of aryepiglottic folds, ventricular bands and vocal cords with occlusion of the airway consistent with hematoma	Conservative[a] exploratory

[a] Bed rest, humidification, Anti-H2, and corticoids.

CC, cricoid cartilage; F, female; HR, heart rate; ISS, injury severity score; M, male; O_2Sat.: oxygen saturation with oxygen delivery; ORIF, open reduction and internal fixation; OTI, orotracheal intubation; RFM, reservoir facial mask; SABP, systolic arterial blood pressure; T, trauma; TBI, traumatic brain injury; TC, thyroid cartilage; VMask, Venti-Mask at 40%.

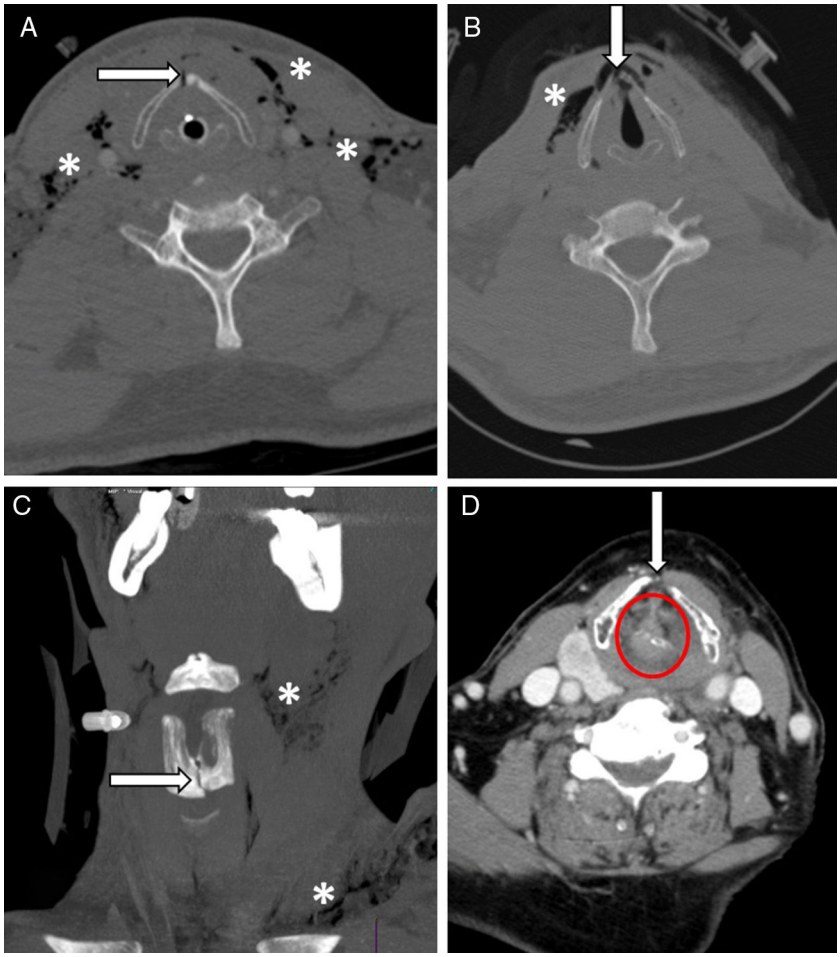

Figure 1 (A) Case #2. Fracture of thyroid cartilage with a 4 mm opening (arrow) and subcutaneous emphysema (asterisk). (B) Case #3: nondisplaced fracture of the thyroid cartilage with solution of continuity (arrow) and subcutaneous emphysema (asterisk). (C) Case #4: sagittal fracture of the thyroid cartilage with solution of continuity (arrow) and cervical emphysema (asterisk). (D) Case #6: hematoma and edema with occlusion of the airway (arrow).

Case #6

Attempted strangulation that led to loss of consciousness and sphincter relaxation, which is why the patient went back to the hospital after recovery. The patient complained of cervical pain, dysphonia and laryngeal stridor. After being examined at the ER, the patient was administered hydrocortisone and then transferred with Venti-Mask at 40% for a CT scan that confirmed the hematoma-induced AW collapse and the presence of swelling (Fig. 1D) and tachypnea after the study, which is why we were called to act. Since the OTI was difficult, the operating room was notified to perform one tracheostomy procedure.

The incidence of CLI was 0.4% of our admissions. Pain and dysphonia were the most common symptoms of all, while subcutaneous emphysemas and soft tissue enlargements were the most characteristic signs. Although they are usually the most common signs of all,[4] they may be absent during the first medical examination, and even the coexistence of other associated wounds, such as the presence of pneumothorax, can mask and delay diagnosis with the corresponding prognostic consequences.[5] Five (5) out of the 6 patients had other traumas being the maxillofacial trauma the most common of all and consistent with the cases described by medical literature.[6]

The management of the AW is a priority in these patients, being the transfer to the closest center available a priority in the case of an emergency for the management of the AW. The way to do this is still controversial, however, we should distinguish between the existence or not of respiratory compromise. However, in life-threatening situations there is no clear-cut recommendation on the management of the AW. In our own experience, we used the protocol for the management of difficult airway established for OTI procedures, and only proceeded with the surgical AW when the implementation of the former protocol was not possible and the patient could not be ventilated manually.[7] We should remember here that both techniques, or ventilation, can aggravate the wounds and require the immediate replacement or isolation of the AW through surgical tracheostomy[8] or this procedure should be the primary urgent AW isolation technique as it was the case with 50% of our patients.

After securing the patency of the AW, cervical management and HS, the patient should be transferred for radiologic study purposes with a CT scan. All wounds were categorized as stage II and III; in these wounds, the TC fracture was found in 83.3% of the patients, well above the 37% recorded by Becker et al.[9] However, the presence of small hematomas or minimum solutions of continuity of the laryngeal mucosa

can be difficult to see on a radiologic study, thereby underestimating the actual incidence of CLI.

The definitive treatment of the wounds should be guided following Schaefer-Fuhrman classification. Cases #2 and #3 required urgent ORIF surgery, since the early surgical management of patients with a surgical indication has proven to bring beneficial effects to these patients' clinical progression, which makes it is the most importance aspect of the care provided at a capable center.[10]

With our series of cases we wanted to conclude that CLI is an uncommon entity where clinical suspicion, the optimal early management of the airway, and multidisciplinary care in a capable center may impact positively the prognosis of patients.

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Complications during intra-hospital transport of pediatric patient on extracorporeal membrane oxygenation☆

Complicaciones del traslado intrahospitalario del paciente pediátrico en oxigenación por membrana extracorpórea

During the clinical care of pediatric patients admitted to a pediatric intensive care unit (PICU), organ damage can be serious and lead to the implementation of more complex techniques such as extracorporeal membrane oxygenation (ECMO) support. ECMO is an extracorporeal life support technique that can be used in neonatal, pediatric or adult patients with heart and/or respiratory failure that is refractory to conventional medical support or to advanced ventilation strategies.[1] Added to the implementation of complex therapeutic techniques, we should also bear in mind that these critically ill children may require treatment at the hospital through diagnostic and/or therapeutic interventions, that is, procedures that are associated with clinical complications and more morbimortality for the patient.

Fully aware of this and since the Spanish medical literature is shorthanded on this regard, we reviewed the complications derived from the intra-hospital transfer of pediatric patients on ECMO and the initiatives taken in a tertiary care pediatric hospital from October 2013 to January 2018 after the implementation of a protocol on the management of intra-hospital transfers on ECMO back in October 2013 (Table 1). We gathered the clinical histories associated with age, the clinical diagnosis of the patient that triggered the use of ECMO, the type of support used (veno-venous or veno-arterial), the location of the cannulas (cervical, femoral or transthoracic), the factors affecting the transfer (reperfusion cannula or thoracic drainage), the appearance of transfer-related complications, the consequences to these complications, and the solutions proposed.

Thus, from October 2013 to April 2017 a total of 26 ECMOs were used on 24 patients with an average 8.1 days (1–15) on ECMO support. Out of all the ECMOs analyzed, there were 16 transfers in 12 of the 24 patients included in the study (2 of them were twice on ECMO support). Nine (9) of these 12 patients were males and 3 were females with a mean age of 60 months (1–132). Three (3) patients required 2 intra-hospital transfers each and the remaining 10 required only transfer one. Seven (7) of these patients were transferred to the cath. lab, 7 to the pediatric surgical block, and 2 to the radiology unit. All of them were on veno-arterial ECMO:

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