

# Closed External Trauma of the Larynx: About Four Cases Collected in Bamako

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**Abstract:** Objective: The purpose of our work was to review through four observations the mechanisms of injury, the main signs calling for classification in the management of blunt external trauma to the larynx in a hospital of last resort in Mali. Observations: We reported a series of four cases of blunt external trauma to the larynx, all of which occurred in the context of a public road accident (AVP) with reception of the shock at the level of the anterior part of the neck. Dysphonia was the most constant sign, it was associated with dyspnea. All our patients had benefited from a Nasofibroscope or a direct laryngoscopy and a pharyngolaryngeal computed tomography allowing them to be classified according to the classification of Schaefer and Fuhrmann. A patient with arytenoid dislocation underwent endoscopic reduction. Exploratory cervicotomy was performed in one patient. Conclusion: Adequate management of external trauma to the larynx requires a structured, rapid and precise diagnostic and therapeutic approach. This constitutes a challenge in our context where the mobilization of the patient and the diagnostic means (nasofibroscope or a direct laryngoscopy, pharyngolaryngeal computed tomography) in the absence of third-party payment are part of a course of overcoming obstacles.

**Keywords:** External Trauma, Dyspnea, Laryngotracheal Disinsertion

## 1. Introduction

External trauma to the larynx is a rare injury, particularly in children [1]. This is explained by its anatomical situation (the flexion of the mandible on the sternum in front, the SCM muscle laterally and the cervical spine behind), its vertical and transverse mobility allows it to "flee" in the face of the shock

and finally its elasticity especially in children allows him to absorb the shock without fracturing. These traumas predominate in young adult males [1, 3-5]. Laryngeal lesions can cause dramatic respiratory disorders involving immediate vital prognosis. In the absence of respiratory disorders, laryngeal lesions may go unnoticed in cases of blunt trauma, hence the need for a meticulous laryngeal examination in any multiple

trauma patient. The classification of Schaefer modified by Fuhmann makes it possible to make a precise lesion assessment in order to develop an adequate strategy allowing the management of these traumatisms [3, 4]. These traumas have not yet been reported in our practice conditions in Mali.

The purpose of this work is to review our clinical cases and to discuss them with regard to current data in the literature.

## 2. Observation

### 2.1. Observation 1

SK 31 years old, female, shopkeeper, residing in Bamako, was admitted to ENT hospitalization on 09/23/2020 for inspiratory dyspnea.

His clinical history goes back to 13 days of his hospitalization by a sudden onset dysphonia following a road accident associated with a notion of epistaxis, odynophagia. No notion of initial loss of consciousness was found. Ten days later, progressive inspiratory dyspnea appeared, which prompted her admission to the ENT department for better management.

As a medical history, she was pregnant at 35 weeks of amenorrhea and type II diabetic for a year on insulin.

The ENT examination on admission found on nasofibroscopy a dislocation of the left arytenoid associated with edema of the ventricular band masking the homolateral vocal cord. Right cordo-arytenoid mobility was preserved, however a small glottic cleft persisted on phonation.

The pharyngo-laryngeal CT showed an undisplaced linear continuity solution of the left lateral wing of the thyroid cartilage with ipsilateral compressive para laryngeal hypodensity.

These data enabled us to classify our patient as Schaefer-Fuhmann stage 2.

A subisthmic tracheotomy was performed followed by endoscopic reduction of the dislocation. Postoperatively, the patient was put on methylprednisolone at a dosage of 80mg/d from D1 to D4 then 40mg/d from D5 to D10, paracetamol infusion 60 mg/kg/day, insulin depot 10UI in the morning, 10UI in the evening with control capillary blood glucose every 24 hours with the collaboration of diabetologists, ceftriaxone 1g every 12 hours.

On D26 of hospitalization, the patient was caesarean and the consequences were unremarkable. The evolution has been favorable. The control nasofibroscopy noted a normal glottic canal with good cordo-arytenoid mobility. The tracheostomy tube was closed on D32 postoperatively. Discharge was effective on D38 postoperative.

### 2.2. Observation 2

AT, 16 years old, male, student, resident in Bamako-Sotuba was admitted on 07/12/20 for cervical trauma.

His clinical history dates back to 3 hours before his admission by a motorcyclist accident with shock against the front of the neck.

The immediate consequences were made of installation of dysphagia, hemoptysis, dysphonia and a discreet dyspnea

which was the reason of reference on the ENT department.

On examination we noted a linear superficial wound on the left mandible 4 cm in length and diffuse cervical swelling extending from the anterior region to the right supraclavicular region and with a sensation of snowy crepitation under the fingers at the back. palpation. The nasofibroscopy noted an edema of the ventricular bands with a limitation of the movements of the two arytenoids.

Cervical CT showed images of diffuse hypodensity with no continuity of the cartilaginous skeleton. The laryngeal architecture was unremarkable.

The exploitation of these data allowed us to classify our patient: Schaefer-Fuhmann stage 1.

The patient was put on amoxicillin 100 mg/kg/day in two doses plus methyl-prednisolone 80 mg from D0 to D3 then a decreasing dose of 40 mg/day from D4 to D8 and paracetamol at 60 mg/kg/day.

The patient was discharged on D9 post admission with normalization of local signs and persistence of mild dysphonia.

### 2.3. Observation 3

Y. K, 23 years old, male, single, domiciled in Ségou, laborer, was admitted to the emergency reception service on 03/19/21 for cervical trauma.

The history of the disease has found a notion of a public road accident with a direct impact of the neck on the door of a vehicle which occurred at 1 a.m. The immediate consequences were marked by progressive and permanent odynophagia, dysphonia and dyspnea. We also noted external bleeding from the mouth and nose.

On admission, there was isolated basicervical tumefaction involving the supra and sub hyoid and supra clavicular regions, bilateral with a snowy crackle under the skin.

Cervical CT revealed diffuse hypodensity of the entire cervical region and a solution of continuity on the left side of the thyroid cartilage with overlapping of the fragments (figure 1).

The patient was classified as Schaefer-Fuhmann stage 3.

We performed a trans-isthmic tracheotomy.

Endoscopic examination under GA noted significant mucosal decay with almost complete obstruction of the glottic canal.

Cervicotomy revealed a double crash of the thyroid cartilage located on either side of the thyroid notch, facing the plane of the vocal cords (figure 2). A median thyrotomy revealed disinsertion of the right and left ventricular bands of the 2 CV plane extending to the posterior commissure. The reinsertion was made using an extra-mucous point using vicryl 4 (0) and we proceeded to a repositioning of the thyroid cartilage with a cartilaginous suture and of the perichondrium using simple stitches.

A two-plane closure was performed on suction drainage (figure 4).

A nasogastric feeding tube was inserted.

The patient was placed on a decreasing dose of methylprednisone starting with 120 mg from D0 to D4 then from D5 to D14 then gradually to complete weaning on D19. At the same time, he was put on amoxicillin 100 mg/kg/day from D0 to D15 and on a proton pump inhibitor twice a day. A methylene blue test was performed on D20, after which the

patient was weaned from the catheter. On D26 the plug test was done on the tracheostomy tube and on D27 and D28 he was weaned from the tracheostomy tube. The patient was discharged on D29 with mild residual dysphonia. The nasofiberscopic control noted a slight delay in mobilization of the left CV.

#### 2.4. Observation 4

DT, 25 years old, residing in Djelibougou-doumazana was seen in the emergency room on 05/04/21 for cervical trauma.

His clinical history found an AVP which occurred on 5/04/21 at 10 a.m. Moto-charrette. The patient was transferred to the CSCOM emergency room in Banamba. The immediate aftermath was marked by bloody vomiting with no notion of immediate loss of consciousness. One hour later, odynophagia appeared associated with dysphonia and progressive and permanent onset dyspnea.

On local admission, the subhyoid region was the seat of a painful antero-cervical swelling with snowy crepitations under the fingers. Nasofibroscopy revealed edema of the left hemilarynx with fixity suggesting cricoarytenoid dislocation.

On the cervical CT scan, hypodensity of the anterior cervical region was isolated, dotted with gaseous clearness without solution of continuity at the level of the laryngeal cartilages.

We classified our patient: Schaefer-Fuhmann stage 2.

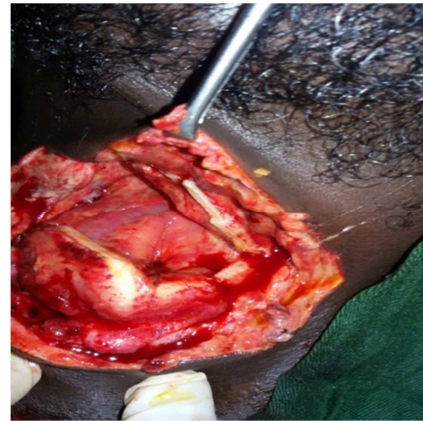
A safety tracheotomy followed by endoscopic reduction of the dislocation was performed.

The patient was put on amoxicillin 100 mg/kg/day in two doses plus methyl-prednisolone 120 mg from D0 to D3 then a decreasing dose of 80 mg/day from D4 to D7 and paracetamol at 60 mg/kg/day.

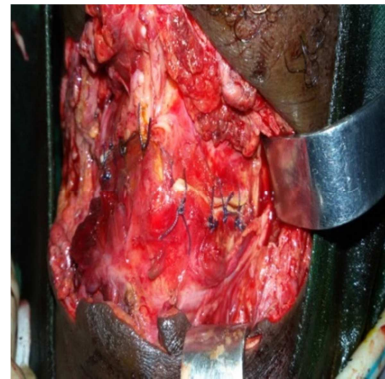
The patient was discharged on D8 post-admission with normalization of local signs on control nasofibroscopy and persistence of mild dysphonia.



**Figure 1.** Axial cervical CT section passing through C5. Solution of continuity of the left lateral wing of the thyroid cartilage associated with hyperclarity arranged in a honeycomb around the laryngeal axis.



**Figure 2.** Double smash of thyroid cartilage. Coiled ventricular bands.



**Figure 3.** Reconstruction of thyroid cartilage with cartilage suture using single stitches.



**Figure 4.** Tracheotomy and suction drainage.

### 3. Discussion

We have shared with the literature [1] that external trauma to the larynx is a rare lesion. In adults, their incidence is approximately 1/30,000, representing less than 1% of all acute trauma [1].

Blunt trauma is the most frequent with an estimated incidence of 80 to 85% [1]. In the all-comers emergency department of our practice hospital in one year from August 2020 to July 2021 inclusive, we only recorded 4 cases of trauma out of 25,200 admissions, i.e. 0.015%.

Our series, modest, 3 out of 4 cases involved young adult males, which has been noted by many authors [2, 5].

"Public road accidents as a major cause of these injuries in our context", is an assertion well shared by the authors [1] who estimate that it is responsible for 57% of the cases followed by sports accidents and attempts autolysis [1]. The same is true of our lesion mechanism by direct shock with reception at the level of the anterior face of the neck compressing the larynx at the cervical spine, which is also commonly accepted [2].

In our clinical cases we noted with the authors [1, 3] a great semiological richness. Dysphonia seemed to be a constant sign in our cases as already reported by the authors [1, 5]. We were unable to isolate the concordance between odynophagia/hypersialhorrea and digestive lesions as mentioned by certain authors [1, 2]. However, the cough/hemoptysis concordance with the mucosal lesions noted by the authors [2] could be established by nasofibroscopy.

But we have always used nasofibroscopy sparingly despite the fact that many authors put it first [2, 6] highlighting its ability to assess the overall appearance of the endolarynx, the state of the mucosa, the position of the arytenoids and the mobility of the vocal cords. It makes it possible to search for any displaced cartilaginous fractures modifying the architecture of the laryngeal sector [2, 3]. We first took care to preserve the freedom of the upper airways by preserving a large caliber venous line and administering corticosteroid boluses and/or by primary tracheostomy under local anesthesia in 3 out of 4 cases. In these cases, the tracheotomy was the first stage of a lesion assessment by rigid endoscopy and/or exploratory cervicotomy.

We have prioritized CT for lesion assessment and loco-regional assessment despite the fact that it is reported that a lesion of the cervical spine can be eliminated by performing AP and lateral cervical radiographs [1-3].

We have, as reported by the authors, classified our patients on cervical CT and nasofibroscopy data according to the Schaefer-Fuhmann classification [1-3].

Thus we had a patient presenting a hematoma and/or minor endolaryngeal lacerations, with an absence of detectable laryngeal fracture and a minimal alteration of the respiratory system classified according to the literature [1-3] at Schaeffer-Fuhmann stage 1.

Two of our patients were classified as Stage II [1-3] corresponding to lesions such as oedema, hematomas and/or minor mucosal wounds without denudation of the cartilages, and an alteration of the spinal cord. breathing of variable degree with undisplaced fracture.

On the other hand, the last patient with massive edema, significant mucosal lacerations, cartilage denudation, displaced cartilage fracture, laryngeal immobility and major dyspnea corresponded to stage 3 according to Schaeffer-Fuhmann. It did not correspond to stage 4 or in addition we would have noticed an anterior rupture of the larynx and an unstable laryngeal fracture and even less to stage 5 where we would have had a laryngotracheal disinsertion.

For our three major cases, we prioritized systematic tracheotomy and endoscopic examination under GA as recommended by certain authors [1, 2, 3, 7, 8].

We preferred tracheostomy under local anesthesia as the first safety step to switch to general anesthesia and perform the exploratory cervicotomy; however, this sublocal tracheostomy is the reference method for many authors to ensure the freedom of the airways [1, 8, 11, 12]. In this context, we did not share the observation of Gussack GS [9] who proposed to carry out for the time of general anesthesia in a safety measure a cautious intubation performed by an experienced operator with a small probe provided provide the materials needed for a tracheotomy [9].

Throughout the literature, intubation is reputed to carry a significant risk of failure, aggravation of endolaryngeal lesions, false routes and decompensation of laryngotracheal disinsertion. It is not indicated in the case of lesions of the cervical spine [1].

In our series, we did not have a child, however it is reported in this case not to consider the realization of the tracheotomy under local anesthesia. The authors then propose performing tracheobronchoscopy under GA possibly combined with a tracheostomy performed on the tube of the bronchoscope.

In all cases, we hospitalized our patients to supervise the care because it is reported that any laryngeal trauma, even minor, requires hospitalization for monitoring for at least 24 hours given the risk of secondary aggravation of the lesions [1, 3].

For medical treatment we did not have access to aerosol therapy and humidifiers as reported by some authors, however we used corticosteroid therapy, analgesics and anti-reflux treatments also reported by authors [1, 3]. Our objective was, as reported in the literature, to limit the risk of stenosis to preserve both respiratory function and phonatory function [5].

For the exploratory cervicotomy that we performed, we intervened less than 18 hours from the trauma. However, this decision is controversial, especially for some authors this period must be within the first 24 hours [1, 5, 7] other authors suggest around the 3-5th day after the regression of the edema. However, the indication was justified because, according to the authors, stage III, IV and V trauma, after primary tracheostomy and endoscopy, requires surgical exploration [1, 4].

In this, our concern was to provide early management to reduce the risk of infection and limit the progression towards stenotic lesions as reported by certain authors [1, 5].

The relatively good result obtained on the patient is a source of meditation for the constitution of our approach in terms of intervention time. For our cases of cricoarytenoid dislocation as recommended by the literature, we performed endoscopic reduction, a procedure that can be attempted in the absence of a fracture. We did not need thyrotomy under general anesthesia during which reduction can be considered in the event of failure [5]. But some authors suggest thyrotomy in all cases [8, 10]. During cervicotomy, we had

the axiom that the closure of the larynx must be performed hermetically to better secure the fractured fragments [5]. Some authors recommend the placement of a stent as soon as there is a significant risk of cicatricial stenosis (significant mucosal laceration with exposure of the cartilage) [13, 14]. Several varieties can be used: T tubes and sterile glove finger cots [13, 14]. In our series, we did not resort to stenting. The placement of the nasogastric tube also proceeded from a rule well shared by the authors who believe that it allows the larynx to rest and hasten healing. We found only 2 cases of well-controlled pharyngostomes and no vasculo-nervous lesions considered to be rare [1, 5].

The sequelae reported by the authors are represented by stenoses and synechiae, which we did not note perhaps because of the modesty of our sample.

## 4. Conclusion

Adequate management of external trauma to the larynx requires a structured, rapid and precise diagnostic and therapeutic approach. This constitutes a challenge in our context where the mobilization of the patient and the diagnostic means (nasofibroscope, CT) in the absence of third-party payment are part of a course of overcoming obstacles.

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