

## CASO CLÍNICO

# Subglottic Stenosis: A Difficult Airway Management Case Report

## *Estenose Subglótica: Caso Clínico de Gestão de uma Via Aérea Difícil*

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### Keywords

Airway Management; Intubation, Intratracheal/adverse effects; Laryngostenosis; Tracheal Stenosis; Tracheostomy/adverse effects; Treatment Outcome

### Palavras-chave

*Estenose Traqueal; Intubação Intratraqueal/efeitos adversos; Laringostenose; Manuseio das Vias Aéreas; Resultado do Tratamento; Traqueostomia/efeitos adversos*

## ABSTRACT

Subglottic stenosis is an important complication following invasive airway manipulation for long periods of time. Only a small percentage of these cases develop clinical repercussions in patient's daily life, however, they are an important cause of difficult airway. This clinical case presents a 43-year-old male patient with a past hospitalization in an Intensive Care Unit in Senegal for an indefinite time. We describe the decisions made upon an unanticipated difficult airway, and the postoperative management of this case of subglottic stenosis.

## RESUMO

A estenose subglótica é uma complicação importante após a manipulação invasiva da via aérea por longos períodos. Sendo que apenas uma pequena percentagem manifesta repercussão clínica no dia-a-dia do doente, são, contudo, uma causa importante de via aérea difícil. Este caso clínico apresenta um paciente do sexo masculino, 43 anos, com um internamento prévio numa Unidade de Cuidados Intensivos no Senegal por tempo indeterminado. Descreve-se as decisões tomadas perante uma via aérea difícil inesperada e a gestão pós-operatória deste caso de estenose subglótica.

## INTRODUCTION

Subglottic stenosis is an important late complication in previously intubated or tracheostomized patients, with an estimated incidence of 12% to 20%. Since only 1%-2% of these situations are symptomatic, and it is not always possible to

obtain a complete medical history, subglottic stenosis may be a cause of unpredictable difficult airway, posing a challenge in airway management.<sup>1-3</sup> The purpose of this paper is to describe one of these situations and its management in the perioperative period.

## CASE REPORT

A 43-year-old male patient of Cape Verdean nationality, 83 kg, presented for femoral intramedullary nail extraction and right hip arthroplasty. He had a history of admission to an intensive care unit in Senegal 10 years ago after trauma with a firearm (three shots). In this context, he was submitted to an exploratory laparotomy and surgery on the left upper and lower limbs. As a sequel of this multiple trauma, he presented with deformity of the left upper limb and right lower limb. In 2019 he was submitted to a vitrectomy under general anesthesia. The anesthesia record described an easy face mask ventilation, difficult head positioning due to voluminous dreadlocks and videolaryngoscopy intubation with a RAE 7.5 tube with complete visualization of the vocal cords and glottis. There were no anesthetic complications described.

The pre-anesthetic evaluation revealed no apparent difficult airway stigmas: Mallampati I, mouth opening > 3 cm, thyromental distance > 6.5 cm, neck circumference < 40 cm without limitations on neck mobility. No alterations were found on the preoperative analytical study, and the electrocardiogram (ECG) was normal for the age group.

After discussing the anesthetic and surgical implications, locoregional anesthesia was proposed, which the patient refused. Thus, the patient signed consent for general anesthesia only. In the operating room, under standard ASA, anesthetic depth (BIS), and neuromuscular blockade (TOF) monitoring, premedication with 2 mg of midazolam was administered,

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followed by pre-oxygenation with 100% O<sub>2</sub> > 3 min. Anesthetic induction was performed using 0.15 mg of fentanyl, 80 mg of 1% lidocaine, and 150 mg of propofol. After confirmation of easy face mask ventilation, 80 mg of rocuronium were administered. The first attempt at orotracheal intubation was performed under direct laryngoscopy with a number 3 Macintosh blade. Having observed a Cormack Lehane grade I laryngoscopy, orotracheal intubation with a simple 7.5 cuffed orotracheal tube was attempted. Difficulty in the progression of the orotracheal tube (OTT) below the vocal cords was found and, after changing the executor, a new attempt was made. This second attempt was also unsuccessful due to the same difficulty. After ventilation with a face mask, a new intubation attempt was made with a 7.0 cuffed tube which was also unsuccessful. A Frova Intubating Introducer was placed that progressed beyond the vocal cords with ease. Despite this fact, there was no success in the progression with TOT 7.0 guided through FROVA. A new period of face mask ventilation was carried out using sevoflurane for anesthetic maintenance. At this stage, help from the difficult airway team was called upon. A new attempt at intubation with a C-mac videolaryngoscope resulted in complete visualization of the vocal cords, but the same difficulty in the progression of TOT 7.0 beyond them remained. At this point, a number 4 I-gel laryngeal mask was placed. After the verification of successful ventilation, fibroscopy was performed through the laryngeal mask as to access what the problem was beyond the vocal cords. For optimization of the fibroscopy 0.5 mg of atropine was given. About 1 cm below the vocal cords, an infraglottic obstruction was verified (Fig. 1). During all the attempts the SpO<sub>2</sub> was never below 95%. After an interdisciplinary discussion, the decision to cancel the surgery was made. Therefore, 200 mg of hydrocortisone was administered as well as sugammadex for a complete reversal of neuromuscular blockade with a TOF-ratio > 95%. The patient was awakened and transferred to the Post Anesthetic Care Unit, where he remained eupneic with SpO<sub>2</sub>>98% and with no signs of respiratory distress. During hospitalization, he was observed in a Pulmonology consultation. Although the patient did not value it and would not mention it previously, he was found to have sporadic stridor. The patient was referred to a Pulmonology consultation in another hospital for lesion stratification and therapeutic measures. Rigid bronchoscopy was performed under manual jet ventilation (Sanders injector) and bronchoscopy showed a complex eccentric stenosis at about 1 cm from the vocal cords, with an orifice at the level of the upper left quadrant of the trachea, with an extension of about 0.5 cm, causing a ~70% reduction in the lumen, compatible with what was found in the previous surgery (Fig. 2). Balloon dilatation was performed as well as 28 Joules laser therapy (770 | 25 shots) and in the end the final patency of the tracheal lumen of about 50% (Fig. 3). At the time of writing this paper, the patient is waiting for endoscopic re-evaluation.

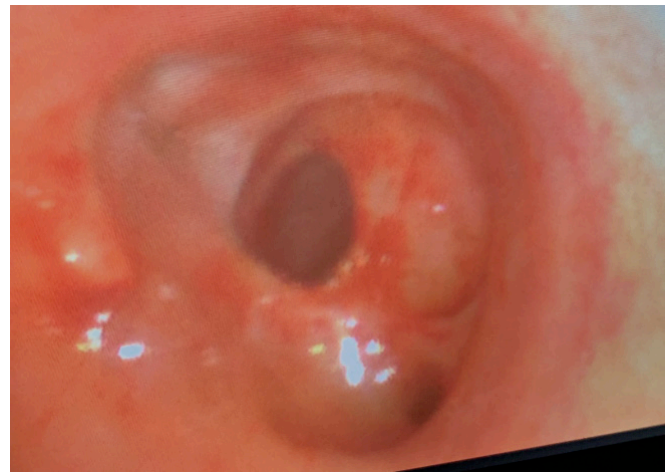


Figure 1. Fibrosopic image of the subglottic stenosis

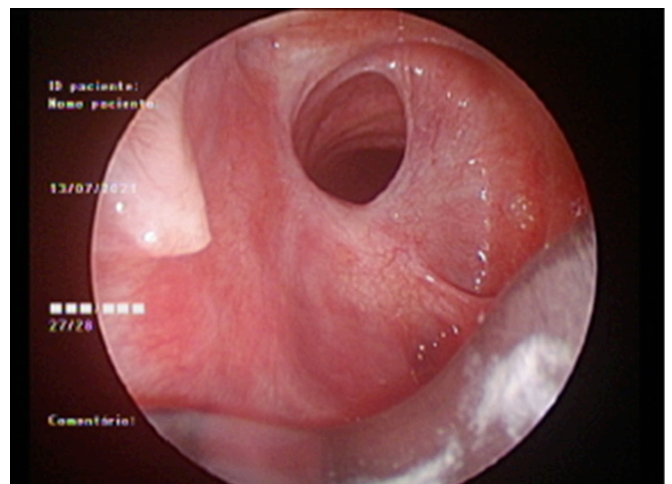


Figure 2. Rigid bronchoscopy image of the stenosis prior to treatment

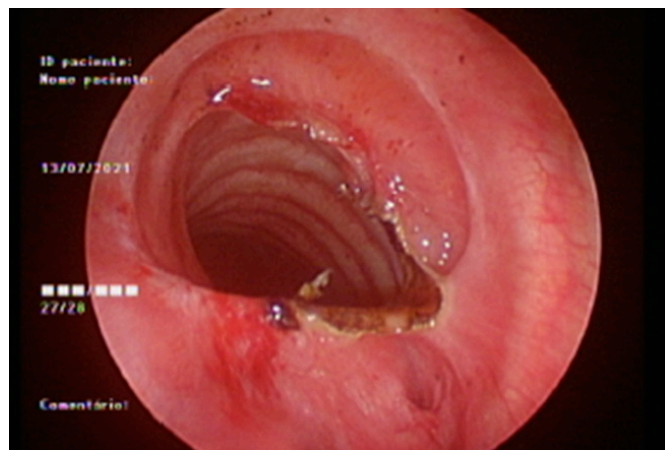


Figure 3. Rigid bronchoscopy image of the stenosis after balloon dilatation and laser therapy

## DISCUSSION

The most common cause of tracheal stenosis is associated with the endotracheal tube or tracheostomy tube cuff. High pressures in the cuff cause hemorrhage and ulceration of the tracheal mucosa with consequent scar fibrosis and airway stenosis.<sup>1,2,4,5</sup> Another less common cause is stenosis

associated with the tracheostomy stoma.<sup>1,2</sup> If symptoms develop, they manifest 3-6 weeks after extubation and include progressive dyspnoea that may be accompanied by wheezing and is sometimes misdiagnosed as an episode of bronchial hyperreactivity.<sup>2,6</sup>

When subglottic stenosis is suspected, a careful clinical history and physical examination are essential, with emphasis on the history of airway manipulation, history of prematurity, congenital anomalies, and the existence of symptoms such as dysphagia, voice changes, and stridor.<sup>7</sup> The gold standard for subglottic assessment is airway endoscopy.

Fibrosopic techniques with spontaneous ventilation allow the dynamic assessment of the airway, cord mobility and, in adult patients, the assessment distal to the vocal cords.<sup>7</sup>

Rigid laryngoscopy and bronchoscopy allow a better assessment of the lesion as well as its treatment, however, they are performed under general anesthesia.<sup>7</sup> The use of computerized tomography can also help in the assessment of the airway, especially in the identification of contributing factors such as external cervical masses, neurological or vascular abnormalities.<sup>8</sup>

A thorough anamnesis and evaluation of the patient's airway is crucial to anticipate difficulties. In the case presented, the initial medical assessment was hampered by the language barrier. Although the patient understood portuguese, he had difficulty expressing himself. Additionally, it was not possible to access the patient's clinical records in Senegal. These difficulties and the darker skin color contributed to the preoperative lack of knowledge of the tracheostomy history (it was not actively asked if the patient had a tracheostomy during his stay at the ICU). In the postoperative period, after careful inspection, a very faint scar was found and when asked about it, the patient confirmed that he had undergone a tracheostomy during his stay in the Intensive Care Unit. It is noteworthy that, despite the severe stenosis he presented, the patient was apparently asymptomatic only mentioning the sporadic stridor after targeted systematic review of all respiratory symptoms after the surgery. It is important to stress, however, that after the trauma, the patient had a functional limitation, moving around using a wheelchair. Another important factor in deciding on the initial approach to the airway was the past history of an apparently uncomplicated orotracheal intubation in 2019.

After the initial failure in orotracheal intubation, and facing a difficult airway due to difficulty in orotracheal intubation as defined by the ASA<sup>9</sup>, the difficult airway approach algorithm based on those proposed by the ASA<sup>9</sup> was followed. Initially, changing the executor, changing the diameter of the orotracheal tube, assisting with introducers (FROVA), changing the laryngoscope to videolaryngoscopy, placing a supraglottic device and, finally, performing fibroscopy.

During the entire process, ventilation of the patient was ensured through face mask ventilation, and the patient's

saturations remained >95% throughout the entire approach. Fibroscopy should be used not only as a technique for intubation but also as a diagnostic tool.

In this case, instead of insisting in continuously smaller orotracheal tubes we opted for a diagnostic technique to try to identify the cause for difficulty.

Postoperatively the treatment and management of laryngeal stenosis should be carried out by experts in the field. In mild to moderate cases, a conservative strategy may be chosen, whereas in more severe cases surgical, endoscopic or, in very severe cases, tracheostomy will be the therapeutic options to be considered.

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