

Bronchoscopic topical steroid instillation in prevention of tracheal stenosis

Ankit Agarwal, D K Singh

Department of Anesthesiology and Critical Care, Institute of Medical Sciences, BHU, Varanasi, Uttar Pradesh, India

Abstract

Corrosive acid poisoning commonly results in chemical injuries to respiratory and upper gastrointestinal tract. Corrosive mucosal erosion of the larynx and trachea may occur if the patient aspirates acid. We successfully used local anti-inflammatory action of dexamethasone instilled through a fiber-optic bronchoscope for regression of mucosal edema and prevention of subsequent development of stricture in a young female.

Key words: Fiberoptic bronchoscopy, steroid instillation, tracheal stenosis

Introduction

Corrosive acid poisoning is quiet common in population with suicidal intent or psychiatric disorders. Systemic steroids are often used for regression of airway edema. We however, uniquely instilled steroids locally through a fiber-optic bronchoscope directly at the site of the lesion. The patient had a successful outcome.

Case Report

We received a 22 year girl, a known schizophrenic, with alleged history of acid ingestion followed by multiple episodes of vomiting and abdominal pain. She presented in altered sensorium (Glasgow Coma Sacle (GCS)-E₂V₂M₃) with rapid shallow breathing. In view of her low GCS (<8), trachea was intubated with a size 7.0 mm cuffed endotracheal tube in the emergency department and she was subsequently shifted to the critical care unit for further management. She was initially put on synchronized intermittent mandatory ventilation mode with

tidal volume 450 ml, respiratory rate 12/min and a pressure support of 14 cm H₂O. Gradually her respiratory effort improved, and she could be weaned to continuous positive airway pressure mode with a pressure support of 10 cm H₂O. Eventually, she was weaned off to T-piece within 24 h of admission to ICU and was extubated on day 2 of admission. Post-extubation arterial blood gas analysis on FiO₂ 0.21 was pH-7.443, PaCO₂-36.0 mm Hg, and PaO₂-243 mm Hg. After around 6 h of extubation patient started developing respiratory distress with inspiratory stridor and a respiratory rate of 40-42 breaths/min. Hence reintubation was performed with difficulty using a snugly fitting 6.0 mm endotracheal tube. A USG neck was planned to diagnose the cause and site of airway obstruction, and it revealed supraglottic tracheal narrowing and edema. As she could be intubated with a maximum tube size of 6.0 mm only, which offered resistance to breathing, a percutaneous tracheostomy was planned below the level of tracheal narrowing so as to bypass the pathology as confirmed by USG. She was tracheostomized with 7.5 mm cuffed tracheostomy tube. Fiber-optic bronchoscopy was carried out to observe the mucosal changes. Tracheal mucosa showed intense inflammation. These inflammatory changes prompted us towards initiation of steroid therapy. We explored the option of nebulized steroids but owing to tracheostomy site being below the inflammation site, nebulized steroids would bypass the pathology and proven futile. We therefore planned topical instillation of dexamethasone right at the site of inflammation through a fiber-optic bronchoscope. We used a dilute solution of dexamethasone. A total of 8 mg dexamethasone was diluted to a volume of 5 ml. The tip of the bronchoscope was positioned in the trachea so as to focus the lesion. The steroid solution was loaded in a syringe,

Address for correspondence: Dr. Ankit Agarwal,
Department of Anesthesiology and Critical Care, Institute of Medical
Sciences, BHU, Varanasi, Uttar Pradesh, India.
E-mail: drankit80@gmail.com

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which was attached to the oxygen insufflation port of the bronchoscope. The solution was then pushed down through the bronchoscope along with simultaneous fine rotation of the fiber-optic tip so that the steroid solution topically covered the lesion. The bronchoscope was then withdrawn. This method of steroid instillation was performed once in 8 h. With progressive instillation of dexamethasone for 5 days, we noticed progressive resolution of edema and near normalization of tracheal mucosal epithelium [Figures 1-4]. Eventually, patient was decannulated on the 7th day of admission.

Discussion

Although tracheal stenosis is infrequently associated with acid corrosive ingestion, its prevention is difficult and treatment prolonged and protracted. Caustic ingestion results in thrombosis of small vessels with inflammation, formation of granulation tissue with subsequent collagen deposition and fibrosis, thus stricture formation.^[1-3]

In the present case, initial improvement of ventilator parameters with eventual extubation indicated that the patient's respiratory status improved and was nearing normal. However, development of stridor within a short span of 6 h of extubation prompted us to suspect that the patient had mucosal edema, which was initially contained due to the ETT *in situ*. Soon after extubation, it expanded leading to respiratory compromise, which was subsequently confirmed on USG.

Various treatment modalities both medical and surgical have been used in treatment of tracheal stenosis such as intralesional mitomycin injection, systemic steroids, surgical reconstruction, cryotherapy, electrocautery, bougie dilation, balloon dilation, and stent placement.^[4]

Steroids have potent anti-inflammatory action due to inhibition of cytokines, enzymes and inflammatory mediators and induction of anti-inflammatory factors like lipocortins. Systemic as well as percutaneous intralesional

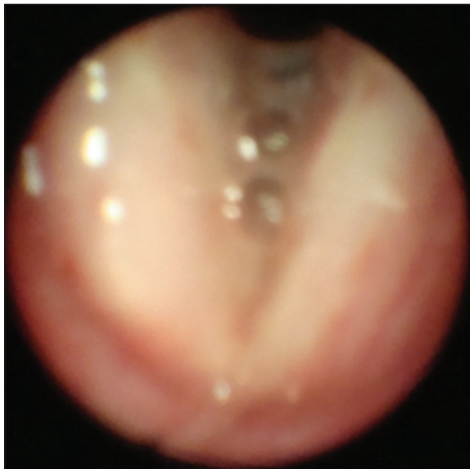


Figure 1: Initial bronchoscopic view with marked edema and airway narrowing

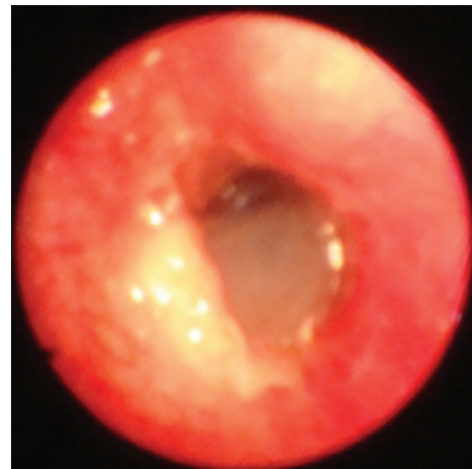


Figure 2: Marked narrowing with intense mucosal inflammation

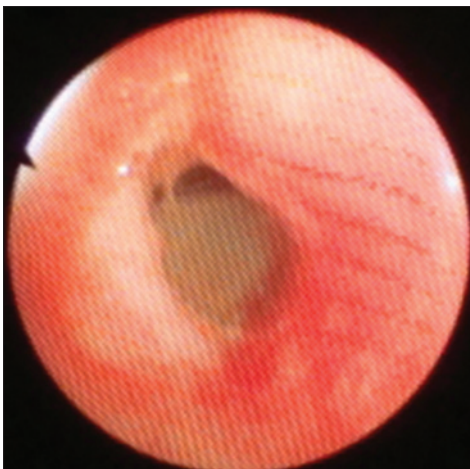


Figure 3: Regressing inflammation

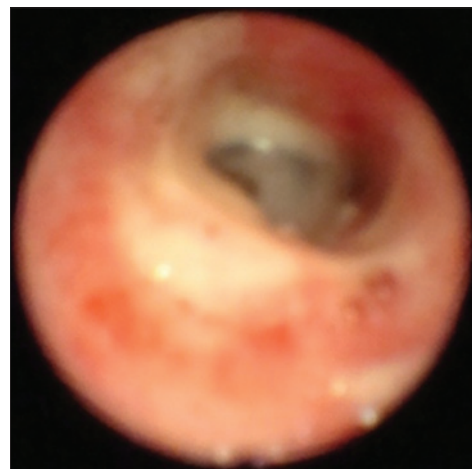


Figure 4: Progressive decrease in hyperemia and resolution of tissue edema

injection of steroids has been well-documented in treatment of tracheal mucosal inflammation.^[5] Such topical use of steroids, intratracheally has not yet been documented in the literature; However, studies have been carried out in the past with topically applied steroid on endotracheal tube resulting in a favorable outcome in terms of incidence of post-extubation cough and hoarseness.^[6] This indirectly supports our case also. The present case report is just an introduction to what might be an established future therapy. Firmer results shall be available if such case series is carried out over time, and if results be positive, this treatment modality might establish itself as a preferred alternative. Systemic steroids in treatment of laryngeal stenosis have also been reported. However, systemic administration pre-disposes to a number of adverse effects such as infection, hyperglycemia, osteoporosis depending upon the dose and duration. Local instillation obviates this and rationalizes their use in local inflammatory conditions. Such modality will thus be useful where systemic steroids are to avoided and there is some limitation of practicing other methods of steroid therapy like nebulization. We therefore successfully instilled steroid locally through a fiber-optic bronchoscope

to regress inflammation and prevent subsequent scarring and fibrosis.

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