

## Necrotizing fasciitis of the neck: considerations about two cases

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**Abstract.** *Background and aim of the work:* necrotizing fasciitis is a rapidly progressing life-threatening infection of the deep fat and fascial layers, which rarely occurs in the neck. The aim of the paper is to report the management of this rare condition, pointing out the role of multimodality in achieving the cure of the patient. *Methods:* we report our experience regarding the management of two cases of necrotizing fasciitis of the neck successfully treated with surgical and medical treatment. *Discussion:* early diagnosis of necrotizing fasciitis of the neck plays a central role in preventing progression of the disease. Multimodal treatment should be mandatory. *Conclusions:* securing of the airway, immediate aggressive surgical debridement, and antibacterial agents administration represent the effective treatment in preventing progression of the disease. Intensive care support should be considered as an integral part of treatment. ([www.actabiomedica.it](http://www.actabiomedica.it))

**Key words:** necrotizing fasciitis, mediastinitis, deep neck infections, surgical debridement, tracheotomy, streptococcus.

### Introduction

Necrotizing fasciitis (NF) is a rapidly progressing infection of the deep fat and fascial layers, which rarely occurs in the neck (1). This is a life-threatening condition with a mortality rate estimated to range between 20% and 60% (2, 3).

Primary focus of infection is frequently located in the teeth, tonsils and skin. Skin trauma and surgical procedures have been also advocated as causes of NF of the neck (4-6). Two different forms of NF can be recognized: a suppurative form characterized by purulent collection, and gaseous form characterized by gas formation.

When untreated, death can occur for acute loss of upper airway, sepsis, or onset of descending necrotizing mediastinitis. Then, prompt diagnosis is mandatory in reducing mortality.

The aim of the paper is to report the management

of this rare condition pointing out the role of multimodal treatment for achieving the cure of the patient.

### Case 1

A 43-year-old man came to our attention complaining of fever and indurated cellulitic swelling in the anterior and right side of his neck. Five days before admission he had experienced dysphonia, which partially resolved with acetaminophen. Flexible fiberoptic laryngoscopy showed a marked edema of the right false cord and ary-epiglottic fold, and an obliteration of the right pyriform sinus. Laryngeal respiratory patency was preserved. No comorbidities were present. Leukocyte count was 18,690 per cubic millimetre with neutrophilia, and C-Reactive Protein was 41 mg per decilitre. Serum creatine phosphokinase, potassium, aldolase, lactate dehydrogenase, glutamic-oxaloacetic transaminase, and myoglobin levels

were normal. Intravenous therapy with piperacillin/tazobactam 4,5 g three times daily and clindamycin 600 mg four times daily was started. Contrast-enhanced computed tomography of the neck and the chest showed gas and hypodense material in the prelaryngeal and right perivascular deep neck spaces. (Fig. 1) There were no signs of mediastinal involvement. Clinical and radiological findings were consistent with the diagnosis of NF of the neck. After awake fiberoptic naso-tracheal intubation, the patient underwent tracheotomy and concomitant surgical exploration of the neck. Intraoperative findings revealed a malodorous malodorous fluid collection and necrotic tissue within the deep neck spaces. Non-viable tissue was then removed and three suction drainages were inserted into the lateral deep neck spaces. The patient spent the first two postoperative days in intensive care unit on a respirator, in order to control ensuing respiratory complications. Clinical and laboratory findings indicated a rapid improvement after surgery. Microbiologic studies yielded a heavy growth of *Streptococcus constellatus* and mixed Gram-negative anaerobic bacilli. Two further "second look" surgical interventions were necessary in order to assess tissue viability. Suction drainages were removed on day 14<sup>th</sup> postoperative day. Thacheotomy was removed on 16<sup>th</sup> postoperative day. The patient recovered after surgery



**Figure 1.** Case 1 contrast-enhanced computed tomography showing hypodense material (arrows) in the prelaryngeal, and right perivascular deep neck spaces under the sternocleidomastoid muscle. Bubbles of gas (arrowhead) are present in the prelaryngeal tissues.

and was discharged on 18<sup>th</sup> postoperative day with oral amoxicillin/clavulanic acid 1 g three times a day. Oral antibiotics were discontinued two weeks after, with a normal leukocyte count and C-Reactive Proteine.

### Case 2

A 58-year-old woman came to our attention complaining of fever, severe dyspnea, and indurated cellulitic swelling in the anterior and right side of her neck. Two days before admission she had experienced mild dysphagia and right-sided odynophagia. Flexible fiberoptic laryngoscopy showed a marked edema of the supraglottic larynx and right lateral wall of the hypopharynx. Laryngeal respiratory patency was severely reduced. Glucose serum level was 182 milligram per decilitre. Leukocyte count was 17,450 per cubic millimetre with neutrophilia, and C-Reactive Protein was 74 mg per decilitre. Serum creatine phosphokinase, potassium, aldolase, lactate dehydrogenase and glutamic-oxaloacetic transaminase, and myoglobin levels were normal. Intravenous therapy with piperacillin/tazobactam 4,5 g three times a day and clindamycin 600 mg four times a day was started. Contrast-enhanced computed tomography of the neck and the chest showed the presence of hypodense material in the prelaryngeal, pretracheal, and right perivascular deep neck spaces. Deep neck spaces collections were gas-free. Right internal jugular vein was not visible on computed tomography. Doppler ultrasonography revealed a right internal jugular vein thrombosis. There were no signs of mediastinal involvement. Diagnosis of NF of the neck was made. After awake fiberoptic intubation, the patient underwent urgent tracheotomy and surgical exploration of the neck. Surgery showed multiple fluid collections within the deep neck spaces. Non-viable tissue was removed and four suction drainages were inserted into the deep neck spaces. The patient spent her first two postoperative days in intensive care unit on a respirator, in order to control ensuing respiratory complications. Microbiologic studies yielded a heavy growth of *Streptococcus hominis*. Microbial sensitivity tests revealed a resistance to clindamycin. Intravenous daptomycin 350 mg once daily, meropenem 1 g three times daily, and rifampicin 600 mg once daily. Six further

“second look” surgical interventions were necessary in order to assess tissue viability. During her hospital stay the patient developed an acute respiratory failure, requiring a new referral in intensive care unit. Chest x-ray showed a right-sided pleural collection. Thoracentesis showed citrine serous collection. A suction drainage was placed into the right pleural cavity and collection gradually resolved over the following 7 days. Microbiologic tests on pleural collection revealed no bacterial growth. Suctions were removed from the neck on 32<sup>nd</sup> postoperative day. C-Reactive Protein returned normal (0.83 milligram per decilitre) on 38<sup>th</sup> postoperative day, and tracheotomy was removed on 41<sup>st</sup> postoperative day. The patient was discharged on 43<sup>rd</sup> postoperative day with oral amoxicillin/clavulanic acid 1 g three times daily for two weeks and enoxaparin 6,000 U.I. once daily. Oral antibiotics were discontinued after leukocyte count normalization.

## Discussion

An acute laryngitis in the first case, and an acute pharyngitis in the second case may have been the primary focus of infection. This suggests that in some cases primary focus can be only hypothesized on the basis of complaints at presentation.

Early diagnosis plays a central role in preventing progression of the disease. Signs and symptoms of NF include fever, painful cellulitis over the affected area, and subcutaneous emphysema. Acute obstruction of the upper airway due to laryngeal edema, can occur and it represents a potential cause of death. Infection can reach the thorax by spreading inferiorly from the neck to the mediastinum along the carotid sheath, or through the retropharyngeal and prevertebral spaces. Systemic involvement generally ensues few days after the onset of infection. It is characterized by signs of septic shock and organ dysfunction, due to disseminated intravascular coagulation. Despite of this, clinical features of NF of the neck can be quite subtle. In such cases diagnosis requires a high index of suspicion. Contrast-enhanced computed tomography is useful in clarifying the diagnosis. It permits to carefully evaluate the presence of fluid and gas collections either in the deep spaces of the neck, or into the mediastinum.

This information plays an important role in choosing the surgical approach, and planning the extension of surgery. Postoperatively serial computed tomography scans may help in monitoring mediastinal complications and in identifying recrudescence of disease.

Immediate surgical debridement of necrotic tissue and infected collections within the deep neck spaces, by extensive opening of fascial layers, represents the cornerstone of treatment for a successful outcome (4, 6). Nonetheless, a single intervention is generally insufficient to achieve recovery from the disease. A “second look” surgery in this setting is a medication under general anesthesia performed after first surgery and consists in the re-exploration of the deep neck spaces in order to remove necrotic tissue and infected material that collect in the neck, and expose the bloody, viable tissue. This procedure should be repeated as often as required on the basis of clinical, laboratory, and radiological findings.

The proper management of the airway is challenging. These patients often experience a severe dyspnea due to pharyngo-laryngeal edematous obstruction. In such cases, a common cause of death is represented by the acute loss of the airway during an attempt to control it (7, 8). Some authors have proposed the awake fiberoptic intubation for airway management of patients with anticipated difficult tracheal intubation caused by infections or tumors. (9, 10). In skilled hands this technique may represent an effective tool in order to secure the airway in an emergency setting. Nevertheless, patients with NF of the neck may require multiple “second look” interventions over a period supposedly longer than 10 days. Then, tracheotomy, performed on occasion of first surgery represents, either for the surgeon or for the anaesthesiologist, the best way for adequately managing the airway in patients requiring repeated surgical interventions. In the reported experience, three operations were necessary in the first case and seven in the second case in order to achieve adequate control of infection in the neck. Serum creatine phosphokinase, potassium, aldolase, lactate dehydrogenase and glutamic-oxaloacetic transaminase, and myoglobin levels should be obtained and carefully monitored in these patients. In particular, creatine phosphokinase represents a sensitive marker of muscular damage. Streptococcal myosi-

tis is reported to raise mortality rate from 20-30% to 80-100% in patients with NF. This makes mandatory aggressive surgical excision of necrotic muscular tissue (11).

Because of poor clinical conditions both patients were transferred in intensive care unit. Intensive support should be considered integral part of treatment because of the possibility of systemic spread of infection. Continuous monitoring of respiratory and cardiovascular parameters is important in order to control respiratory complications, and to depict and treat organ failure.

Necrotizing fasciitis is a polymicrobial infection, which is generally caused by a combination of Streptococci and anaerobic oral flora. In this study *Streptococcus constellatus*, *Streptococcus hominis*, and mixed anaerobic bacilli were isolated. Initial broad-spectrum intravenous antimicrobial agents should be administered until results of microbiologic studies can be available. Penicillin is the drug of choice in the treatment of non-allergic patients. Clindamycin has been advocated by some authors for its capacity "in vitro" to suppress bacterial exotoxins production, and modulate cytokine release. Moreover, it has been reported that clindamycin is more effective, if compared to penicillin alone, in the treatment of necrotizing soft tissue infections, although in normal practice a combination of this two agents is generally used (12). Nevertheless, in the reported case n. 2, clindamycin was interrupted because microbial sensitivity tests revealed bacterial resistance. Duration of antibacterial agents administration should be prolonged until leukocyte count and C-Reactive Protein normalization. This may require several weeks, and generally implies an oral shift from intravenous administration after patient discharge. Oral antibiotic should be chosen on the basis of microbiologic studies, and microbial sensitivity tests.

Some authors suggest that intravenous immunoglobulin administration may be an effective adjunctive therapy in patients with severe Group A Streptococci infections, possibly because of its ability to neutralize bacterial exotoxins (13, 14). Adjuvant hyperbaric oxygen therapy has been reported to improve the outcome and survival of patients with NF (6). Preservation of viable surrounding tissue, direct bactericidal effect, leukocytes activation, angiogenesis, and

wound healing have been proposed as possible mechanisms to explain favourable effects of hyperbaric oxygen therapy (15).

## Conclusions

NF is a rare and potentially life-threatening infection of the deep fat and fascial layers, which rarely occurs in the neck. Early diagnosis is of utmost importance. Multimodal treatment should be mandatory. Immediate aggressive surgical debridement, securing of the airway, and anti-bacterial agents represent the only effective treatment in preventing progression of the disease. Intensive care support should be considered integral part of treatment.

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