

# Cervical Necrotizing Fasciitis of Odontogenic Origin and Hyperbaric Oxygen Therapy

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**Abstract:** Necrotizing fasciitis (NF) is an infection of the soft tissues pathology with high mortality that spreads through the fascial planes and rarely seen in head and neck region. The cause of infection is often odontogenic problems. Broad-spectrum antibiotics, surgical debridement, and hyperbaric oxygen therapy (HBO) are important for the treatment of disease. We report a case of cervical NF in a 33-year-old woman who was treated with rapid surgical debridement and simultaneous HBO.

**Key Words:** Cervical, hyperbaric oxygen therapy, necrotizing fasciitis, odontogenic

Cervical necrotizing fasciitis (CNF) is an infectious pathology with high mortality that spreads through the fascial planes and leads to connective tissue necrosis. It frequently affects the walls of the abdomen, perineum, and extremities. Involvement of the head and neck region is very rare.<sup>1</sup> In the CNF, the access route is often through odontogenic infections or trauma. Cervical fascia is the fibrous tissue that divides structures of the neck and is divided into superficial and deep layers. The superficial layer of the deep cervical fascia envelops parotid and submandibular glands and it is the outer border of the odontogenic neck infections.<sup>2</sup> Most of these infections originate from the second or third mandibular teeth infection or extraction. Dental extraction can be done both intraorally and extraorally.<sup>3</sup> The roots of the second and third molars extend submandibular space, so infections of this site can spread through the cervical fascia and the mediastinal region.<sup>4</sup> Physical examination and computed tomography (CT) are important for the diagnosis of the disease. Rapid aggressive antibiotic therapy should be initiated to prevent mortal complications and the disease site should be cleared by surgical debridement in the first 72 hours.<sup>5</sup>

## CLINICAL REPORT

A 33-year-old woman was admitted to our hospital with complaints of pain, erythema, swelling, and scar formation in the right neck

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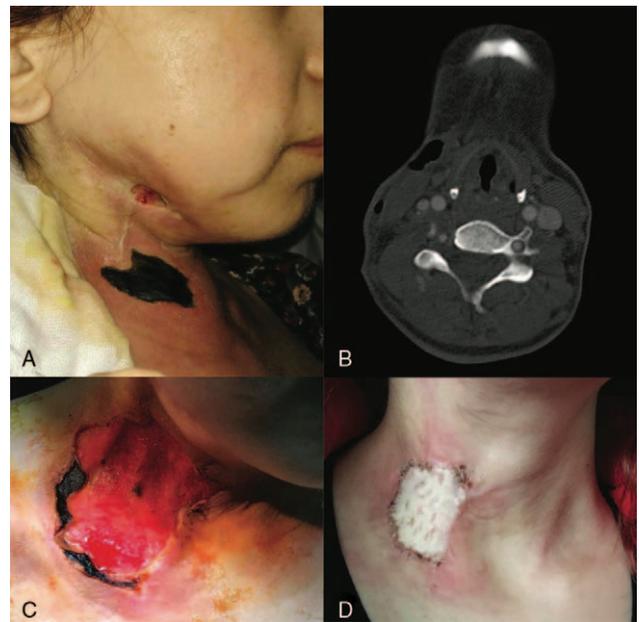
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**FIGURE 1.** (A) The necrotic wound on the skin that is extending from the right submandibular region to the supraclavicular area, the fistula, and brown purulent discharge. (B) Axial computed tomography scan reveals gas images and fluid collection. (C) After surgical debridement. Infection is limited to superficial fascia and platysma. (D) Defect is reconstructed with a split thickness skin graft.

region. The patient had dental extraction with intraoral approach for right mandibular third molar 20 days ago. After the dental extraction, patient had pain on right side of the neck, fever, and she was treated with oral antibiotics as oral amoxicillin-clavulanic acid, metronidazole, and intramuscular cefuroxime before referred to our clinic. The necrotic wound on the skin that was extending from the right submandibular region to the supraclavicular area, the hyperemia around this area, the fistula, and brown purulent discharge were observed at the physical examination (Fig. 1A).

Laboratory findings were white blood cells  $12.4 \times 10^3$  cells/ $\mu$ L, neutrophil 88.1%, and C-reactive protein (CRP) 143 mg/L. Hypocalcemia, hypopotassemia, and hypoalbuminemia were detected. Computed tomography revealed a defect in the skin at the level of the mandibular body and air images between the subcutaneous and deep muscle planes extending in the inferior cervical region. Skin, subcutaneous fatty tissues, and deep soft tissue planes were edematous. Gas images and fluid collection were detected in the effected region. These findings were extending to the breast level along the right frontal wall of the thorax (Fig. 1B). Anemia was detected during laboratory tests. Peripheral blood smear showed segmented neutrophils, poikilocytosis. The gene fusion tests for *JAK-2* and *BCR-ABL* were negative for hematologic malignancies.

Teicoplanin 3 \* 400 mg/day and meropenem 3 \* 1 g/day treatments were started to patient. On the second day, necrotized tissues were cleaned with surgical debridement under general anesthesia. The incision was done to the border of the lesion. Neck structures (sternocleidomastoid muscle and infrahyoid muscles) were, edematous but the infection was limited to superficial fascia and platysma (Fig. 1C). Submandibular gland was normal and there was no infection around the gland. The skin defect was not reconstructed during the surgery. Hyperbaric oxygen therapy (HBO) was started after debridement immediately and patient was followed by daily dressing using betadine and hydrogen peroxide. Peptostreptococcus species was isolated in the anaerobic bacterial culture sent from the wound site. Following day 10, white blood cell was measured as

$7.3 \times 10^3$  cells/ $\mu$ L and CRP as 10 mg/L. HBO treatment was completed in 31 sessions. In the follow-up, the findings of the infection were significantly reduced and the remaining defect was reconstructed with a split thickness skin graft (Fig. 1D).

## DISCUSSION

Necrotizing fasciitis (NF) was firstly described by army surgeon Joseph Jones during the American Civil War in 1871 as “hospital gangrene.” The disease describes a fulminant infection that leads to necrosis in the connective tissue and spreads through the fascia planes and is highly mortal in untreated patients.<sup>6</sup>

NF often affects abdominal wall, perineum, and tissues in extremities. Involvement of head and neck region is very rare. The disease is usually limited to subcutaneous tissue and muscle involvement is rare. The synergistic effect of polymicrobial infections (aerobes and anaerobes) and the enzymes, which is produced by these bacteria, causes necrosis of subcutaneous tissues, skin, fascia and even muscles.<sup>7,8</sup> The pathway of infection is often through odontogenic infections or trauma.<sup>1,5,9</sup> Adekanye et al reported the site of infection in 8 patients. Two patients were idiopathic, 2 patients were odontogenic, 2 patients were pharyngeal/tonsillar, 1 patient had nasal malignancy, and 1 patient had trauma etiology.<sup>6</sup> Although NF can be seen in all ages, it is more common in the elderly and progresses more rapidly in patients with diabetes, chronic renal failure, malignancy, chronic infection, intravenous drug abuse, and immunodeficiency.<sup>10</sup> In our patient, only low socioeconomic level and malnutrition were thought as predisposing factor.

In clinical presentation, rapidly developing painful erythema, fever, dysphagia, and trismus can be detected. The disease looks like abscess or cellulitis in early stages. Skin is hyperemic and stretched. There may be hyperesthesia or numbness with touching. The benign image of the disease causes delay of the diagnosis. In the advanced stages of the disease, the skin becomes thick and a purple-blue irregular area appears at the border of the wound and it is characteristic for NF.<sup>5</sup> CT is the most useful imaging modality. Vascular erosion, mediastinitis, expansion of infection in preoperative period, and the gas bubbles at the infection area can be evaluated by CT scan examination.<sup>11</sup> Subcutaneous gas bubbles can also be seen on plain radiographs. All patients have dehydration and malnutrition due to dysphagia at the time of diagnosis. Hyponatremia, hypoproteinemia, hypocalcemia, and dehydration can be detected in severe cases. Leukocytosis, neutrophilia, and elevated CRP levels are commonly seen as laboratory findings. Misdiagnosis and delayed start of treatment can cause severe systemic toxicity, carotid artery erosion, jugular vein thrombophlebitis, aspiration pneumonia, meningitis, and mediastinitis. Mortality is 15% to 40%.<sup>5</sup>

Isolated organisms from bacterial cultures are hemolytic streptococci, coagulase-positive staphylococci, *Proteus mirabilis*, *Clostridium perfringens*, *Bacteriodes fragilis*, *Pseudomonas auriginosa*, and *Klebsiella* species.<sup>12</sup> NF is basically divided into 2 types according to bacterial species. Type 1 has both aerobic and anaerobic polymicrobial infections; type 2 occurs with *Streptococcus pyogenes* alone or in combination with *Staphylococcus* species.<sup>13</sup>

Treatment comprises aggressive antibiotic therapy and surgical resection. Rapid and empirically initiated antibiotic therapy should include metronidazole and clindamycin for anaerobic treatment in addition to high-dose penicillin G or ceftriaxone.<sup>14</sup>

Hyperbaric oxygen therapy has an important place among treatment methods and it has bactericidal effect for anaerobes. It returns the tissues to normal oxygen conditions, provides angiogenesis, and helps in healing wounds. HBO treatment shortens hospitalization time and reduces mortality and quantities of surgical debridement.<sup>15</sup> Wolf et al reported 17 CNF patients. Surgical debridement was performed in all of the patients within 2 days, and broad-spectrum antibiotics and immunoglobulin were applied.

They used HBO treatment for all of the patients. Mortality was not seen, but 12 of 17 patients healed with morbidity.<sup>16</sup>

## CONCLUSIONS

NF of the head and neck region is very rare, but it has high mortality rates. Early diagnosis and aggressive antibiotic treatment play an important role for the management of the disease. HBO therapy should be considered for all CNF patients if there is no contraindication. Rapid hyperbaric oxygen therapy must be added to antibiotics and surgical treatment for preventing from mortal complications.

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## Is Orbital Floor Reconstruction With Titanium Mesh Safe?

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**Abstract:** To reconstruct the orbital floor defects there are a lot of reconstruction materials, the surgeon must choose one of them. The authors share their experience with 10 patients suffering from orbital trauma causing orbital floor fracture; those fractures were