

**Case
Report**

Hyperbaric Oxygen (HBO₂) in the treatment of Lemierre Syndrome

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Hodgson R, Emig M, Pisarello J. Hyperbaric oxygen (HBO₂) in the treatment of Lemierre Syndrome. *Undersea Hyperb Med* 2003; 30(2):87-92 - In 1936 Lemierre described an aggressive neck infection with a high mortality rate. In the original characterization, he describes a pharyngotonsillitis and/or peritonsillar infection followed by unilateral swelling and tenderness along the sternocleidomastoid muscle owing to septic thrombophlebitis of the internal jugular vein. Subsequent to invasion and thrombophlebitis of the internal jugular vein, *Fusobacterium necrophorum* septicemia occurs, with rigors, high fever, and septic thromboembolism to peripheral sites, especially the lungs and bones. This entity became known as Lemierre Syndrome. Hyperbaric Oxygen (HBO₂) has been described as adjunctive treatment in two cases of postanginal septicemia. This case describes the combined approach to a case of Lemierre Syndrome in which HBO₂ was added as an adjunct to the treatment, with a favorable and rapid improvement in the patient's condition.

Lemierre Syndrome, hyperbaric oxygen therapy, post anginal septicemia, Fusobacterium Necroforum

INTRODUCTION

In 1936 Lemierre described an aggressive neck infection with a high mortality rate characterized by pharyngotonsillitis and/or peritonsillar infection followed by unilateral swelling and tenderness along the sternocleidomastoid muscle. This resulted from septic thrombophlebitis of the internal jugular vein from *fusobacterium necrophorum*, and has become known as Lemierre Syndrome (1). It is associated with septicemia, rigors, high fever, and septic embolism of peripheral sites, especially the lungs and bones. In the pre-antibiotic era mortality was as high as 90%.

Hagelskjer et al. reported a retrospective review of the epidemiology of Lemierre syndrome in Denmark covering a 6-year period from 1990 – 1995. They reported an incidence of 0.8 cases per million persons per year. Twenty- four patients were identified, all of whom were previously healthy. An increase in incidence was noted during the period of review, postulated to be a possible result of the more restricted use of penicillin in the treatment of tonsillitis (2,3,4).

Lemierre Syndrome is still a potentially life-threatening disease with a mortality of 4 – 18% (5). Recent review of 109 cases describes a mortality of 6.4% (6). A strong correlation exists between the delay of clinical recognition (with resultant delayed initiation of therapy) and the risk for metastatic infection. Metastatic spread of disease, most commonly to the lungs and

joints, was present in 104 of 109 patients (95%) at the time of diagnosis, mostly due to delay in diagnosis of this disease (6).

Hyperbaric oxygen (HBO₂) has been described as adjunctive treatment in two cases of postanginal septicemia by Walsh and Myers (7). Traditional wisdom and practice suggests that without excision of the suppurative thrombophlebitic vein a high mortality rate ensues and cure is unlikely. However, in their review of 109 cases Chirinos found only nine cases that required internal jugular vein ligation with thrombectomy (8%), suggesting that surgical intervention is rare (6). Surgical approach to these patients indeed may be life sparing but deforming. This report describes a case of Lemierre syndrome treated with a combined approach in which HBO₂ was an adjunctive treatment with a favorable and rapid improvement in the patient's condition.

CASE REPORT

An 18 year-old man was in excellent health until seven days prior to admission, when he developed pharyngitis, headache, abdominal pain, and lower extremity pain with walking. Rapid streptococcal screen and throat culture the day after were negative. Five days prior to admission he had decrease in oral intake, a single episode of vomiting without diarrhea, chills, sweating and an oral temperature recorded at 38.3°C (101°F). A slight cough with whitish-yellow sputum and occasional streaks of blood was also reported. A 10-pound weight loss was documented from the time of onset of the symptoms. Monospot (heterophile) antibody was negative on the day prior to admission. While en-route to obtain a chest X-ray the patient became acutely short of breath, with rigors and cyanosis around the mouth and of his hands. In the emergency department, initial vital signs were: pulse 89, respiration 22, blood pressure 84/32, with room air saturation of 94%. He was admitted to the hospital.

Admission examination revealed an ill appearing and pale but otherwise well-developed male. Tachycardia and tachypnea were prominent, with a pulse of 140/min, a respiratory rate between 24 and 30/min; and blood pressure was 92/36. Temperature was 38.6°C (101.5°F). He was diaphoretic, flushed and anxious. HEENT was normal except that the uvula and posterior pharynx were erythematous. The neck revealed very prominent anterior cervical chain lymphadenopathy, right sided much more prominent than the left. Sinus tachycardia without rubs or gallops was noted on cardiovascular examination. The lungs were clear. The abdomen revealed normal bowel sounds, and was soft and non-tender without evidence of hepatosplenomegaly.

Laboratory examination included a WBC count of 19,000/mm³ (with 73 segs, 18 bands, 2 lymphocytes, and 7 monocytes) and platelet count of 37,000/mm³. Chest X-ray was unremarkable. Lumbar puncture yielded normal results. Blood cultures were obtained and ultimately yielded *fusobacterium necrophorum*. Venous blood gases on 1.5 liters of oxygen were pH 7.411, pCO₂ 36mm Hg, pO₂ 44.5 mm Hg. Twenty-four hours after admission, he had obvious asymmetry of the neck, with fullness on the right. The right neck was exquisitely tender to palpation. Ceftriaxone 2 g every twenty-four hours and clindamycin 600 mg every eight hours intravenous were started empirically. Infectious Disease specialists recommended Unasyn 3 g every 6 hours instead of Ceftriaxone, and continuation of clindamycin, on day two of the hospitalization. The following morning chest X-ray revealed bibasilar infiltrates. CT of the neck showed inflammatory changes of the right parapharyngeal area and thrombosis of the right internal and external jugular veins (Fig. 1). CT of the chest showed multi-lobar peripheral infiltrates in the lingular and right middle lobe and at the lung bases bilaterally (Fig 2). Multiple

pulmonary nodular densities with irregular margins were also noted. The findings were most consistent with septic pulmonary emboli, and a diagnosis of Lemierre Syndrome was confirmed.

An echocardiogram performed three days after admission revealed normal heart structures without valvular vegetation and normal left ventricular systolic function without evidence of pericardial fluid. The patient complained of severe neck and chest pain throughout the course. The hospital course was marked by prostration, tachypnea and persistently spiking fevers to 38.2°C. Seventy-two hours following admission, the repeat blood cultures were sterile.

On the sixth hospital day, the patient remained febrile with an oral temperature as high as 39.3°C (103°F). Exam revealed soft tissue swelling of the right neck with tender cords along the external jugular vein. The chest revealed diminished breath sounds with evidence of dullness at the bases and tubular breath sounds at mid lung field. The heart rate was 130/min with an obvious pericardial rub audible over the left sternum. The chest X-ray continued to show worsening pulmonary parenchymal air space disease CT scans showed mediastinal inflammatory changes down to the level of the aorto-pulmonary window, consistent with anterior mediastinitis. No new emboli were identified; however early signs of cavitation were present. CT of the neck revealed some diminution of the inflammatory changes in the neck. Anticoagulation with heparin was initiated for septic thromboembolism and jugular vein thrombosis. With the patient's condition remaining critical, HBO₂ therapy was considered as a method of avoiding radical neck and mediastinal debridement. WBC count remained at 20,000/mm³. HBO₂ was initiated at 3.0 ATA for 90 minutes twice daily in a monoplace chamber with a five-minute air break at 45 minutes into the treatment to reduce potential oxygen toxicity. Ten treatments were performed with no complications other than initial confinement anxiety, which responded to diazepam.

Ten days following intervention with HBO₂, WBC count was decreased to 8670/mm³. (Figure 1). The patient continued to exhibit some neck pain and persistence of the thrombosis in the internal and external jugular, however he continued to improve clinically and was discharged from the hospital on hospital day 15 to complete a 30-day course of metronidazole.

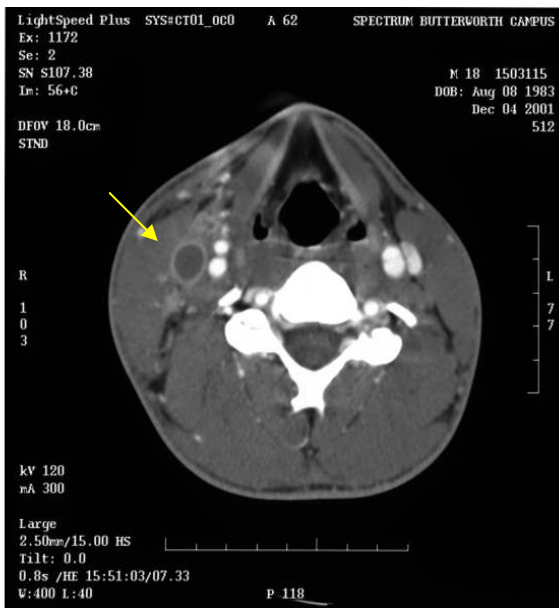


Figure 1 - CT of the neck demonstrating marked right-sided soft tissue swelling and thrombosis of the internal jugular vein (arrow).

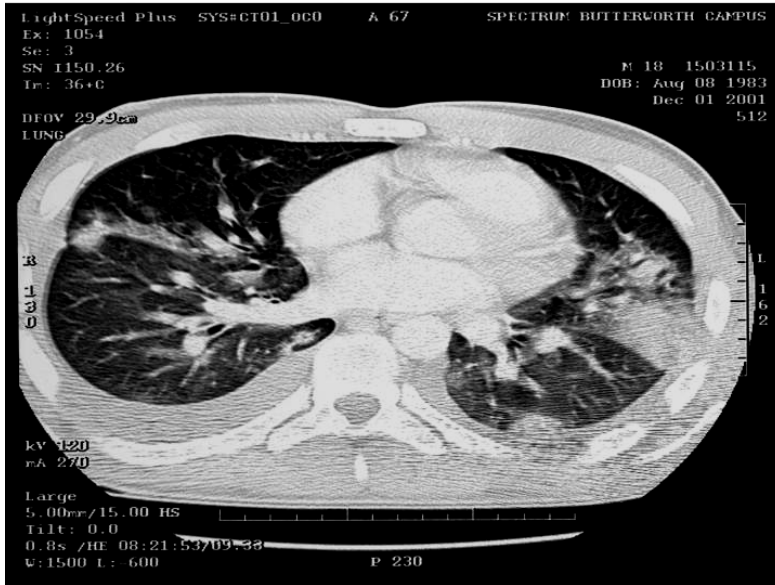


Figure 2 - CT of the chest demonstrating multiple bilateral parenchymal infiltrates and thromboemboli.

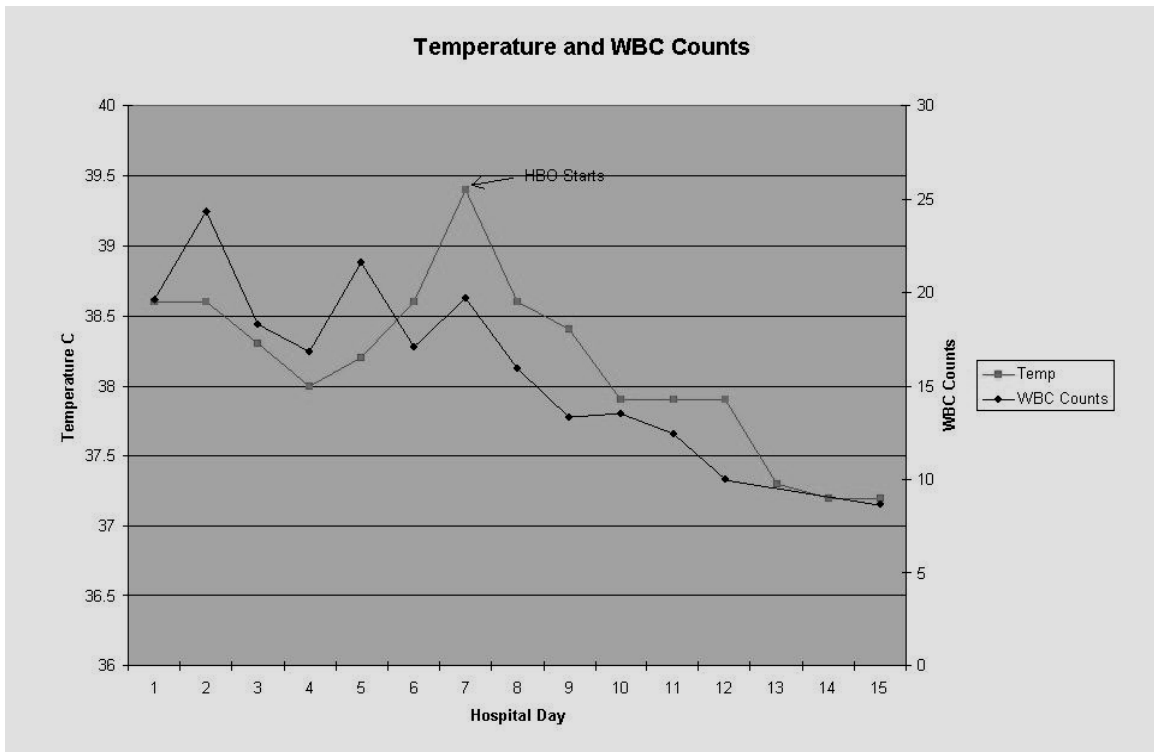


Figure 3- Time course of body temperature and white blood cell count.

At outpatient follow up six weeks after initial admission to the hospital, he was thin, but appeared well. Neck exam revealed evidence of residual internal jugular thrombosis, but was otherwise normal. Radiograph of the chest had normalized completely.

DISCUSSION

Fusobacterium necrophorum is an anerobic gram-negative rod producing a variably strong endotoxin. It is a ubiquitous organism of the oro-pharyngeal cavity that can become opportunistic under appropriate circumstances. Tissue necrosis, poor blood supply, cold, shock, trauma, surgery, foreign bodies, malignancies, edema, and gas production by bacteria may significantly predispose tissue to infection with anerobes. Once anerobes begin to multiply they can maintain their own reduced environment (oxidative-reduction potential) by excreting end products of fermentative metabolism. The mechanism behind HBO₂ activity has multiple potential effects in the settings of anerobic infections (8-10). First, local hypoxia is decreased. Second, while some leukocyte activity (chemotaxis, bacterial ingestion, and degranulation), can occur in anerobic situations, oxygen is required for oxidative killing (respiratory burst). Some bacteria are inhibited by high oxygen tensions and many of the endotoxins that they produce are inactivated by high oxygen tensions as well (11).

The extension of experience with HBO₂ in treating anerobic infections to this rare infection seemed to contribute to the rapid clinical improvement of this patient. However, it is difficult to attribute the clinical response entirely to HBO₂ therapy. The patient's clinical condition was continuing to rapidly decline in the view of the pediatric intensivists and infectious disease specialists caring for the patient. A significant concern was expressed regarding the need for a radical debridement of the neck and mediastinum given the findings of mediastinitis on CT scans. A multi-modality approach to the treatment of Lemierre syndrome is required, with antibiotics, anticoagulation, and possible surgical debridement. HBO₂ may be of benefit in this rare infection. Future study of HBO₂ in this setting is warranted but may be difficult given the low incidence of Lemierre syndrome.

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