Lemierre's Syndrome: The Forgotten Disease?

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Abstract

Lemierre's Syndrome is characterised by a history of recent sore throat, clinical or radiological evidence of internal jugular vein thrombosis and isolation of anaerobic pathogens- typically Fusobacterium necrophorum. Previously considered a forgotten disease due to widespread use of antibiotics for pharyngeal infections, over the past two decades Lemierre's Syndrome has become an increasingly common presenting complaint. Emergence of antibiotic resistance may explain the recent rise in the number of reported cases. Lemierre's Syndrome is associated with significant morbidity and mortality if not diagnosed and treated early. In the pre antibiotic era Lemierre's syndrome was fulminant and fatal in 90% of cases. The classical presentation of Lemierre's Syndrome is that of an acute oropharyngeal infection in a young otherwise healthy young adult, followed several days later by fever, rigors and associated lung complications. Treatment involves a prolonged course of antibiotics, the role of concomitant anticoagulation still remains controversial. This article describes treatment and management of a patient diagnosed with Lemierre's syndrome to illustrate its classical presentation, common pitfalls in diagnosis and optimal management. Our aim is to raise awareness amongst clinicians of this potentially fatal but curable disease.

Introduction

Lemierre's syndrome, named after French physician & bacteriologist Dr. Andre Lemierre is caused by an acute primary oropharyngeal infection leading to secondary development of septic thrombophlebitis of the internal jugular vein with subsequent septicaemia and metastatic emboli, to which the lungs is one of the most commonly affected organs [1,2]. Lemierre's syndrome (also known as postanginal septicaemia or necrobacillosis) is a rare but potentially life-threatening complication of what principally arises from a sore throat.

Lemierre neither discovered nor provided the first description of this condition, however the syndrome came to bear his name as he was the first to provide great clarity on the condition, and unlike many before him placed gram-negative anaerobic bacilli-principally Fusobacterium. necrophorum as the key pathogen [3] (*F. Necrophorum*). This is a non-motile anaerobic gram-negative bacilli. It is in fact a far more important and more commonly arising pathogen in animals than it is in humans. In 1884 Loeffler described a case of Fusobacterium necrophorum causing calf diphtheria [3]. It was much later that Courmont and Cade first described its involvement in human infections causing a post angina septicaemia in 1900 [3]. However, it was not until 1936 when Andre Lemierre published a 20 patient case series in the Lancet that this pathogen and its characteristic presentation became known as a Lemierre's syndrome [4].

In the pre-antibiotic era this syndrome was far more common and was often fulminant and fatal in 7-15days, with a 90% mortality rate [1,2,5]. However with the advent of antibiotics in the late 1940's there was a rapid decline in the number of reported cases of Lemierre's syndrome and it soon became the "forgotten disease". However in the last 2 decades there appears to have been a resurgence of this syndrome, a syndrome that describes by Lemierre was quoted as saying was as being "so characteristic that mistake was almost impossible" [4]. The purpose of this review is to help alert physicians to identify this condition, and emphasise the importance of its prompt diagnosis and treatment.

Case Presentation

A previously fit and healthy 18 year old Caucasian male university student presented to the Emergency Department with a 5 day history of sore throat, fever, rigors, diarrhoea and vomiting. In addition the patient complained of right sided pleuritic chest pain radiating to his right shoulder and back, and a cough productive of green sputum.

On initial assessment the patient was pyrexial with a temperature of 40.2°C, peripherally cyanosed, tachyponeic (respiratory rate 30), and hypoxic with saturation of 75% on room air. Respiratory examination revealed reduced air entry and crepitations at the right lung base. The patient was also tachycardic (heart rate 120) and hypotensive with a blood pressure of 95/42 mmHg. Abdominal examination revealed central abdominal tenderness, however the abdomen was soft, and there were no signs of guarding, rebound tenderness or overt organomegaly. Neurological examination including cranial nerve examination was unremarkable. The patient was noted to have a hyperaemic oropharynx with bilateral tonsilar enlargement.

Investigations

Arterial Blood Gas (ABG) on admission revealed a respiratory alkalosis. Initial blood investigations are as shown in Table 1. Renal function tests were suggestive of an acute pre-renal kidney injury. Liver function tests were also abnormal with a low albumin level of 28, and an isolated raised Alkaline Phosphatase (ALP) of 187. Peripheral blood cultures were sent. In addition EBV titres, HIV test, throat swab, and atypical serology were sent.

Full Blood Count	Urea & Electrolytes
Total white cell count 21.81 × 10^9/l (4-11)	Sodium 129 mmol/l (133-146)
Haemaglobin 46 g/L (130-160)	Potassium 4.1 mmol/l (3.5-5.3)
Mean Corpuscular Volume 87.3 fl (78-98)	Urea 14.7 mmol/l (2.5-7.8)
Platelets 114 × 109/l (150-400)	Creatinine 133 mmol/l (64-111)
Neutrophil count 18.70 × 109/l (2-7.5)	Estimated Glomerular Filt rate 64 ml/min/1.73m2
Monocyte count 1.67 × 109/l (0.2-1.2)	
LIVER FUNCTION & CALCIUM	
Albumin 28 g/L (35-50)	
Ala. Aminotransferase 38 iu/L (0-50)	
Alkaline Phosphatase 184 iu/L (30-130)	
Total Bilirubin 13umol/L (<21)	
Corrected calcium 2.14mmol/L (2.2-2.6	

Table 1: Initial laboratory investigations.

Chest X-ray on admission revealed some subtle right basal shadowing (Figure 1,2), a further chest x-ray performed 6 days later revealed a significant right sided pleural fluid collection/empyema with minor consolidation in the right lower lobe and left upper lobe. To determine the size and nature of the fluid an ultrasound scan of the thorax with skin markings was performed, which confirmed a moderate right sided pleural effusion. Blood cultures results subsequently became available indicating metronidazole sensitive Fusobacterium Necrophorum & Gemella morbillorum. At this stage the suspicion of Lemierre's syndrome was raised and an ultrasound of the neck (Figure 3) was performed revealing thrombosis in the left internal jugular vein (IJV) extending between the angle of mandible and down to the level of the thyroid. Evidence of IJV thrombosis was further confirmed with Computer Tomography (CT) (Figure 4,5), which provided the radiological diagnostic criteria of Lemierre's Syndrome. CT revealed thrombus within the left IJV extending towards the left tonsil. Inflamed tonsils were noted bilaterally, with pockets of gas seen within the tonsils-compatible with tonsillitis. In addition small abscesses were noted in the upper zones of the lungs corresponding to septic emboli likely to have metastasised from the jugular lesion. On day 6 of admission further results became available- EBV screen showed serological evidence of past infection with EBV, however throat swab, atypical serology (i.e. Mycoplasma, leigonella, chamidophila) and HIV test were all negative.

Following ultrasound of the thorax, a right sided pleural aspiration was performed. Pleural fluid was sent for microscopy, cytology, and biochemistry, revealing a fluid total protein of 42 g/L, fluid albumin of

14 g/L. Microscopy indicated a few pus cells with numerous inflammatory cells including polymorphs. Arterial blood gas investigation on the pleural fluid indicateda pH of 7.35, consequently empyema was ruled out, and the effusion was considered to be of parapneumonic origin. Infectious disease and Ear Nose Throat (ENT) services were consulted on day six and the patient was transferred under their joint care.
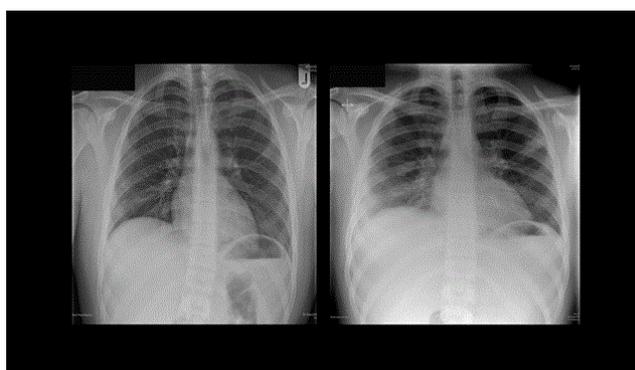

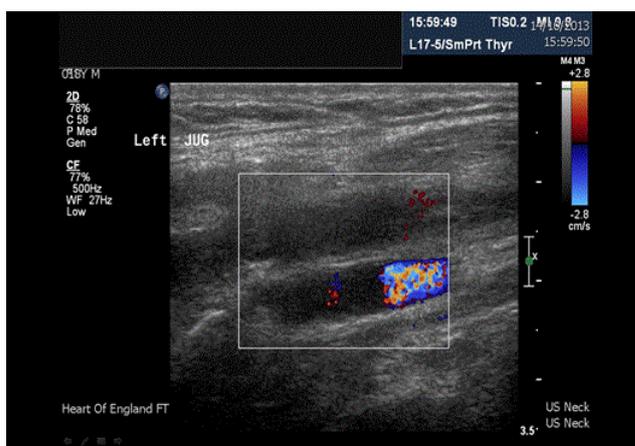**Figure 1,2:** Chest X-ray on admission and day 6 respectively.

Figure 3: Ultrasound Neck revealing thrombosed internal jugular vein, with artery (inferiorly) clearly highlighted with Doppler colour flow.

Treatment

The patient was initially commenced on intravenous (IV) benzylpenicillin and clarithromycin, intravenous fluids, analgesia and antipyretics. However, despite this treatment he continued to spike a temperature for a further 72 hours after admission. On availability of preliminary blood cultures on day two, indicating anaerobic gram variable cocci and gram positive rods, the patient was commenced on IV Tazocin and oral clarithromycin. By day six the patient had been apyrexial for 48 hours and was clinically settled, however clinical examination revealed reduced air entry and dull percussion note at the right base. In addition, his pharynx continued to be hyperaemic, with ongoing bilateral tonsilar enlargement. Full blood culture results became available on day six indicating growth of Fusobacterium

necrophorum and Gemella morbilliorum. Consequently, the patient was continued on IV Tazocin, oral clarithromycin was discontinued and commenced on therapeutic low molecular heparin.
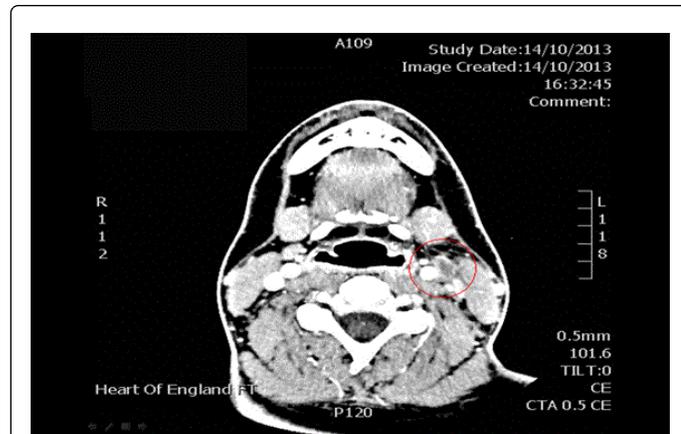

Figure 4: Computer Tomography with contrast- Axial and coronal images (respectively) revealing Left internal jugular vein thrombus (circles).
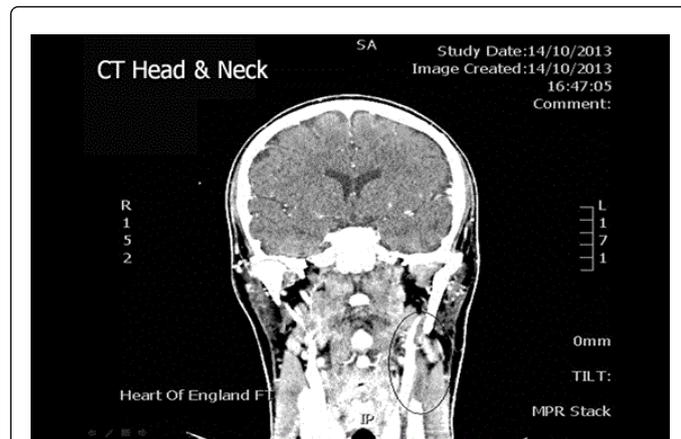

Figure 5: Computer Tomography with contrast- Axial and coronal images (respectively) revealing Left internal jugular vein thrombus (circles).

On day seven the pharynx and tonsils were noted to be normal. By day eight the patient started to spike temperatures again, and developed a wide spread blanching macular rash over his torso and face. Ongoing pyrexia was thought to be due to recurrent pleural effusion and repeat Chest X-ray and Ultrasound thorax confirmed this. Repeat therapeutic pleural aspiration was performed. IV tazocin was discontinued and the patient was commenced on IV metronidazole and oral clarithromycin as the rash was considered to be a beta-lactamase allergic reaction, as wellas to cover the anaerobic nature of this pathogen. The patient continued to improve clinically and biochemically with this combination of antibiotics. After 14 days of hospitalisation the patient's anticoagulation treatment was converted to oral rivaroxaban with a view to potentially discharging the patient home if he continued to improve. One day later the patient was discharged from hospital with a 10 day course of oral clindamycin,

and a three month course of rivaroxaban with follow up appointments under infectious diseases services.

Outcome and follow up

Four days following hospital discharge the patient re-presented to the Emergency Department with a two day history of increasing dyspnoea, right sided pleuritic chest pain and pyrexia. However, there was no history of further pharyngitis/tonsillitis. On admission the patient was tachyponeic, tachycardic and pyrexial, with examination revealing reduced breath sounds and dull percussion note at the right base. Chest X-ray revealed a significantly increased right sided pleural effusion in comparison to earlier chest X-rays, with some scarring in the mid zone of the left lung. The patient was commenced on IV meropenum and metronidzole. Initial blood investigations revealed a raised CRP of 155, raised WBC 17.09, neutrophila 10.88. However the patient's renal and hepatic functions were largely normal. Nevertheless, the patient remained hypoalbuminemic (albumin 29). Anticoagulation was noted to be sub-therapeutic at 1.9 (target INR 2-3). Unsuccessful bedside pleural aspiration was thought to be due to loculated pleural fluid, and a further ultrasound guided aspiration was requested. CT imaging of the thorax indicated that there was a significant right sided pleural effusion, with some right lower lobe consolidation. Additionally there were multiple nodular opacities noted in the right and left upper lobes, and left lower lobe- compatible with metastatic infection and septic emboli. Ultrasound guided pleural aspiration revealed a markedly loculated effusion with multiple septations. Consequently seven days after admission the patient was taken to theatre for a thoracotomy and decortications. He was discharged one week later with further treatment with clindamycin and rivaroxaban.

Literature Review

Clarification of terminology

Lemierre's syndrome is frequently used interchangeably with necrobacillosis and post anginal septicaemia. Necrobacillosis often used synonymously with Lemierre's Syndrome is the presence of *F. Necrophorum* causing human peritonsilar abscesses leading to thrombophlebitis and septicaemia. Thus the term necrobacillosis requires positive microbiology for *F. Necrophorum* [3, 6]. Post anginal septicaemia is a clinical term denoting the complications seen after purulent pharyngitis or peritonsilar abscess [3].

Aetiology

F. Necrophrum is a strictly non-motile, non spore forming, anaerobic, gram-negative bacilli that is part of the a normal flora of the orophayngeal cavity, gastrointestinal tract and female genital tract [7,8].

The Fusobacterium genus comprises 13 different species of which *F. Necrophorum* and *F. Nucleatum* are the most commonly isolated from clinical specimens such as throat swabs or blood cultures. *F. Necrophroum* is not only the more virulent of the two species but also the most commonly associated and isolated in patients diagnosed with Lemierre's syndrome [2,7].

There has been much confusion over the nomenclature of the *F. Necrophorum*, it is thought that there are up to 52 names under which the organism was previously known. Earlier authors referred to it

under names such as Bacillus necrophorus, Bacteroides funduliformis, Bacilus funduliformis, Bacillus symbiophile sand Actinomyces necrophorus amongst many others [2,3].

Much research has been conducted into the taxonomy of *F. Necrophorum* and there is considerable evidence to suggest the *F. Necrophorum* can be classified into two subspecies of which subspecies A- Fusobacterium necrophorum – subspecies Necrophorum is more common in animals and subspecies B- Fusobacterium necrophorum subspecies Funduliforme is the more common species in humans [9,10]. However a study by Hall et al… [9] concluded that not all human isolates fit into subspecies Funduliforme.

Although *F. Necrophorum* is the most common organism reported to cause Lemierre's syndrome, up to one third of patients have a polymicrobial bacteraemia [5]. Frequently present are other miscellaneous anaerobic streptococci and gram negative anaerobes including Bacteroides, Eikenella corrodens, Proteus mirabiliss, Petostreptococcus, Streptococcus oralis, Lactobacilli, Candida and meticillin resistant and sensitive Staphylococcus aureus [11-13].Gemella morbillorum isolated in this case study is also a recognised pathogen causing Lemierre's syndrome, albeit it rare. Gemella morbillorum is thought to be more prevalent in children with tonsilar hyperplasia and adults with recurrent tonsillitis [14]. A study by Chirinos et al… [15] states that cultures may be negative in up to 12.8% of cases.

Epidemiology

Lemierre's syndrome is rare and without early identification and treatment it is potentially fatal. In Andre Lemierres' 20 patient case series in the pre antibiotic era the outcome was fatal in 18 out of 20 (90%). However in more recent times the outcome has become more favourable with a mortality rate varying between 5 to 10% [15-18]. The mortality rate in untreated patients however is still thought to be as high as 30 to 90% [8]. Fatalities even in the post antibiotic era still occur especially with *F. Necrophorum* meningitis [19]. Furthermore mortality rates have been reported to increase to as much as 25% when antibiotics are withheld for 4 days or more [20].

F. Necrophorum has an unusual ability to infect previously healthy children and young adults, unlike other anaerobic bacteria. Over 70% of cases have been documented in young adults between the ages of 16-25 years [21,22]. Although Andre Lemierre reported an equal sex ratio more recent research reports a male preponderance, with a male to female ratio of 2:1 [23,24].

Lemierre's syndrome is a rare disease. A three year prospective study founded in Denmark from 1998 to 2001 detected an annual incidence of 3.6 cases per million, which increased substantially to 14.4 cases per million in young adults between the ages of 15 to 24 [25]. In the last two decades there appears to be an increase in the number of reported cases of Lemierre's syndrome, especially in paediatric cases [26]. The reason for the apparent increase in this once forgotten disease is largely unknown. Possible explanations for the rise in reported cases may be linked to the decline in tonsillectomies since the 1970s, increased awareness or the more prudent use of antibiotics especially in suspected group A β-Haemolytic streptococci throat infections. However little data currently exists to support claims that the incidence of Lemierre's syndrome is on the rise.

Pathogenesis

Lemierre's syndrome progresses in a several stages. The first stage is that of a primary oropharyngeal infection, typically of the palatine tonsils and peritonsillar tissue [2,27]. Of which exudative tonsillitis or peritonsilar abscesses are the most common presentations[1]. Other rare primary sources of infection include mastoiditis, parotitis, otitis media, sinusitis or odontogenic infection [28]. Primary infection with *F. Necrophorum* is followed by local invasion of the lateral pharyngeal space and Internal Jugular Vein (IJV) causing IJV septic thrombophlebitis in 1 to 3 weeks [27]. Secondary thrombophlebitis of the tonsilar veins may also occur. The lateral pharyngeal space is divided into two compartments, the anterior (muscular) and the posterior (neurovascular) compartment. The posterior neurovascular compartment contains the carotid sheath which includes the vagus nerve, IJV, carotid artery, cervical sympathetic trunk, cranial nerves X-XII, and a number of lymph nodes [29]. Invasion of this compartment and compromise of any of these clinical structures gives rise to the clinical findings a physician may elicit during examination in a patient with Lemierre's syndrome [1].

F. Necrophorums ability to invade uncompromised healthy tissues is thought to be related to its extraordinary virulence, unheard of in its anaerobic counterparts. *F. Necrophorum* produces Lipopolysaccharide endotoxins, as well as leucocidin, haemolysin and haemoggluttin [29-31]. It is the combination of these factors that augment its virulence. Haemoggluttin promotes platelet aggregation, whilst leucocidin and haemolysin works to confer the ideal anaerobic environment, prevents leucocyte invasion of the infection site and prevents phagocytosis of the pathogen [32,33].

The percentage of cases and the reason why *F. Necrophorum* goes on to invade the lateral pharyngeal space and cause IJV thrombophlebitis is unknown [15,34]. Some researchers propose that the most likely mechanism involves spread of infection from the palatine or peritonilar tissues either haematogenously via the tonsilar vein causing IJV thrombosis or alternatively lymphatically to the adjacent lateral pharyngeal space causing luminal lymphatic thrombosis [27]. Alternative hypothesis argues that primary viral throat infections such as Infectious Mononucelosis alter the pharyngeal mucosa allowing *F. Necrophorum* direct invasion and extension through the fascial planes into the IJV [15,29]. Several cases of Infectious mononucleosis preceding Lemierre's syndrome have been reported [35, 36]. Approximately 10% of published cases of Lemierre's syndrome are associated with infectious mononucleosis [37]. Another hypothesis suggested that there may be an enhancement of toxins from peri-odontogenic pathogens by nicotine [38], suggesting that smoking may act to enhance *F. Necrophorums* ability to infect and invade the palatine and peritonsilar tissues.

The final stage in Lemierre's syndrome involves septic emboli and metastatic infection. Once infection has invaded the IJV, it can cause a bacteraemia with haematogenous spread to local and distant sites. The lungs are the most common site of metastatic infection and embolic disease, with one review showing that up to 97% of patients diagnosed with Lemierre's syndrome had pulmonary emboli [29]. Metastatic infections via embolisation complicated all of Lemierres' reported cases, with 100% having necrotic lung lesions [4,29,39].

Summary of stages	
1	Orophayngeal infection-typically tonsillitis or peritonsillar abscess.

2	IJV thrombophlebitis initiated by *F. Necrophorums* multiple virulence factors e.g. haemagluttin.
3	Septic emboli and metastatic infections.

Table 1: Summary of stages of Lemierres syndrome

Clinical presentation

On describing what is now known as Lemierre's syndrome- Andre Lemierre was quoted as saying "the appearance and repetition, several days after the onset of a sore throat (and particularly of a tonsilar abscess) several pyrexial attacks and an initial rigor, or still more certainly the occurrence of pulmonary infarcts and arthritic manifestations, constitute a syndrome so characteristic that mistake is almost impossible" [4,11,40]. Oropharyngeal infection typically precedes the onset of septicaemia and metastatic infections by 5-7 days [29] however patient symptoms can be variable, and sore throat may be absent at the time of presentation even without prior use of antibiotics. Therefore it is easy to misdiagnose the syndrome until blood cultures grow *F. Necrophorum* or an anaerobic gram negative rod which only then guides the clinician towards Lemierre's syndrome and the hunt for IJV thrombophlebitis. On initial presentation the tonsils may appear exudative, ulcerated, hyperaemic or normal. Clinical findings during the primary stage are dependent on the initial site of infection. In most reviews and studies sore throat and evidence of pharyngeal inflammation are the primary findings [5,11,13,15,26,41,42]. Fever presents in 82.5% of patients [1], but may not be present at the time of initial presentation. Other presenting symptoms include neck pain, otalgia, pleuritic chest pain, rigors and gastrointestinal symptoms such as abdominal pain, nausea and vomiting.

Sore throat	Pleuritic chest pain
Fever	Otalgia
Abdominal pain	Rigors
Nausea and Vomiting	Neck pain

Table 2: Common presenting symptoms of Lemierre's syndrome

Pharyngeal space infection and IJV thrombosis produces local signs and symptoms. Invasion of the posterior lateral pharyngeal compartment may lead to cranial nerve palsies X-XII or Horners syndrome [15]. The thromboses jugular vein s rarely palpable and local signs may be subtle or absent if the infection is contained within the posterior lateral pharyngeal compartment [1]. Common presentation of IJV thrombophlebitis include ipsilateral neck pain and swelling or induration of the angle of the mandible and along the sternocleidomastoid muscle. In addition it may be associated with trismus [29,39]. Irritation of the sternocleidomastoid muscle may present with pain when turning the head away from the affected side. One study by Chirinos et al.. in which 109 cases were reviewed reported that no significant neck findings are present in 47.7% of patients [15]. Indeed the only finding may be persistent fever. Rare catastrophic complications such as carotid artery rupture have also been reported in the literature [1].

As a consequence of constant bacteraemia septic emboli and metastatic infections occur due to infection and haematogenous spread via the IJV. The most site of embolic disease is the lungs, resembling septic pulmonary emboli [29]. Typical pulmonary findings on chest x-ray are that of bilateral nodular infiltrates or cavitating pneumonia. Associated pleural effusions are seen in 43.1% of cases [1]. Empyemas and lung abscesses pnenumothoraces are common [1,43,44], and adult respiratory distress syndrome requiring ventilator support occurs in 15.5% of cases [15].

The second most common site of septic embolisation are the joints causing either septic arthritis or osteomyelitis, such presentations are seen less commonly now with the advent of antibiotics [29]. Other sites of dissemination include hepatic or splenic abscesses, but these are however rare. Splenomegaly and hepatomegaly however are common [28]. Other common findings reported include slight hyperbilirubinemia with mild derangement of liver enzymes. Other sites of distal embolisation include the meninges, cardiovascular, renal and soft tissues [15,29].

Diagnosis

Diagnosis of Lemierre's syndrome requires a high index of suspicion. The diagnosis is primarily clinical and should be sought early when a history of tonsillitis or pharyngeal abscess preceding respiratory infection , septicaemia and/or persistent fever is given. However in reality most clinicians have never heard of Lemierre's syndrome. However clinical suspicion must be confirmed by objectively meeting the diagnostic criteria [28,37] of this syndrome:

- Recent or current oropharyngeal infection.
- Isolation of an anaerobic pathogen (with at least one positive blood culture).
- Clinical or radiological confirmation of Internal Jugular Vein thrombophlebitis.

However because there may be a delay in culturing anaerobic pathogens (5-8 days) this may delay requesting radiological evidence and more over antimicrobial treatment [40]. The clinical suspicion of IJV thrombophlebitis can be objectively confirmed with modalities such as Computer Tomography (CT) of the neck with contrast, Doppler ultrasonography or Magnetic Resonance Imaging (MRI). However a study by Karkos et al. [13] found that chest x-ray was the first line imaging modality in 92% of patients later diagnosed with Lemierre's syndrome. This may well be a reflection of how many patients present with pulmonary metastatic complications.

CT neck with contrast appears to be the first line and most diagnostic investigation as it can reveal intraluminal filling defects in the IJV and/or tonsilar vein, soft tissue swelling and localisation of abscesses which may require drainage. Furthermore it may reveal other localised complications such as pulmonary emboli or an empyema [11,30,37,39,40].

Doppler Ultrasonography has its advantages over CT as it is non-invasive, less expensive and does not use ionising radiation. Ultrasound will show an echogenic region within a dilated IJV or a complex mass with cystic and solid components [11,15,39]. However Ultrasound is less sensitive and is far inferior when it comes to detecting fresh clots, and thrombus below the clavicle or mandible. Some authors have suggested that with these limitations it should be used only as an adjunct to follow clots already in existence [39].

MRI has also proved useful and has greater sensitivity and soft tissue contrast when compared to other imaging modalities [27]. However due to the cost and limited availability of MRI it is not the first line imaging modality.

Treatment

The main stay of treatment is a prolonged aggressive course of intravenous antibiotics directed at anaerobic microbes, typically of 4 to 6 weeks duration. Due to the rate of pulmonary complications surgical drainage may also be required. *F. Necrophorum* has traditionally been susceptible to penicillin, clindaymcin and metrondiazole [23,25,39]. However it must be noted that some treatment failures have occurred with use of penicillin [43], β lacatamase producing strains of *F. Necrophorum* have been documented and this may explain this observation [39]. Thus β-lacatamase resistant antibiotics should be utilised where necessary [39]. Data currently indicates that there maybe increasing resistance to erythromycin, this may be due to its wide spread use for oropharyngeal infections in children and young adults [46]. With data to suggest that some strains of *F. Necrophorum* are resistant to penicillin's and erythromycin this may account for the perceived increase in incidence in Lemierre's syndrome, as some patients may be being inappropriately treated with resistant antibiotics and thus presenting with the early signs of metastatic complications, as in this case report. One study showed that metronidazole was the most commonly prescribed antibiotic [40]. Metronidazole has excellent oral bioavailability, and confers easy switch to oral therapy from IV when appropriate. It also has good tissue penetrance, and excellent activity against all strains of Fusobacterium sp [3].

The role of anticoagulant use in Lemierre's syndrome remains controversial, as there are no controlled studies. Some authors have recommended anticoagulation in patients where antibiotics alone have failed or where there is clinical or radiological evidence of cavernous sinus thrombosis [2,6].

Finally all patients diagnosed with Lemierre's syndrome should be treated using a multidisciplinary approach. Collaboration with respiratory physicians, microbiologists, radiologists, infectious diseases services and otolaryngologists is essential to provide a positive therapeutic outcome, and to minimise morbidity and mortality.

Summary and Conclusion

Lemierre's syndrome is a rare potentially life threatening illness affecting previously healthy children and young adults. It is characterised by a history of recent or current oropharyngeal infection, clinical or radiological evidence of IJV thrombophlebitis and positive anaerobic bacteria cultured. It was once referred to as the forgotten disease due to the limited number of cases that emerged after the advent of antibiotics. A high index of suspicion is required if symptoms of oropharyngeal infection are accompanied by persistent fever, signs and symptoms suggestive of IJV thrombophlebitis, or septic emboli and metastatic infection- particularly pulmonary. Most cases of Lemierre's are however only diagnosed after *F. Necrophorum* is isolated on blood cultures, prompting clinicians to look for objective evidence of IJV thrombophlebitis using imaging tools such as CT or ultrasound. Early recognition is imperative to allow prompt initiation of appropriate antimicrobial therapy, typically requiring treatment for four to six weeks, which may be combined with anticoagulation therapy. A multidisciplinary approach for patients diagnosed with Lemierre's syndrome is imperative. Collaboration with respiratory physicians, microbiologists, radiologists, infectious diseases services and otolaryngologists is essential to provide a positive therapeutic outcome, and to minimise morbidity and mortality.

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